Occupational safety and health construction industry management (OSHCIM): current practice in Malaysia

Norhazren Izatie Mohd[1], Hamizah Liyana Tajul Ariffin [1], Muhammad Hamka Abdul Hamid[1], Kamarizan Kidam[2], Mohammad Ismail[2], Kherun Nita Binti Ali[1], Nur Emma Mustaffa[1], Jafri Mohd Rohani[2], Noor Nabilah Sabrini[2], Samsiah Abdullah[1], Nazruddin bin Mat Ali[3] and Muhammad Syaiful Ahdat M Fetri[4]

[1] Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia
[2] Faculty of Engineering, Universiti Teknologi Malaysia
[3] Department of Occupational Safety and Health (DOSH), Malaysia
[4] Construction Industry Development Board (CIDB), Malaysia

Email: norhazren@utm.my

Abstract. The accident occurred in the construction industry is reportedly the third-highest after manufacturing and agriculture industry. The percentage of accident cases and fatality ratios in the Malaysian construction industry are getting larger and gradually increasing each year. This data indicates that the safety and health performance in the Malaysian construction industry appears to be weak. Henceforth, the Department of Occupational Safety and Health Malaysia (DOSH) through government initiative has introduced and published a guideline on Occupational Safety and Health in Construction Industry (Management) 2017. This guideline aims to decrease 50% of the fatality rates in the construction industry by 2020. Therefore, this paper sought to review the current OSHCIM practice in Malaysia construction industry towards the OSHCIM implementation. This study adopted a quantitative approach in conducting the data collection and the data analysis process. A set of a questionnaire developed, tested and distributed to the construction stakeholders, i.e. client, designer, safety and health officer, contractor, and enforcer. The results discovered that the OSHCIM concept already being "Practice" by the construction stakeholders in Malaysia in terms of the (1) management, and (2) standard operating procedure elements. Thus, this study shows that the construction stakeholders were currently practising the OSHCIM concept but with different procedure and approach. In conclusion, the implementation of OSHCIM in Malaysia construction industry is foreseen to be well accepted as most of the stakeholders are familiar with the concept of design for safety.

1. Introduction

The construction industry in Malaysia is one of the main catalysts for Malaysia's economic transformation with the development of high impact infrastructure projects under the Tenth Malaysia Plan (10MP) and Eleventh Malaysia Plan (11MP) which also helps to boost the growth of another economic sector [1]. However, according to Occupational Accidents Statistic by Sector till June 2018, there are a total of Death (D) 52 cases, Non-Permanent Disability (NPD) 39 cases and Permanent Disability (PD) 4 cases recorded [2]. The fatality rate ratio per 100,000 workers also increase gradually from 2014 (4.21) to 2017 (4.90) within the construction industry itself and the same thing also happened to the accident rate ratio per 1,000 workers in 2015 (2.81) to 2017 (2.93) [3, 4]. These large number of

cases and increasing ratios indicates the safety performance in the construction industry in Malaysia are not well performed.

Thus, to overcome this issues, Department of Occupational Safety and Health (DOSH) has provided the guidelines on Occupational Safety and Health in Construction Industry (Management) OSHCIM 2017 to be enforced in the construction industry. DOSH investigated that construction industry has the highest number of accident rate involving fatality even though the enforcement by DOSH has continuously taken. The statistic below proved that the presence of enforcement alone is not adequate and failed to eliminate and minimise both hazards and fatality [8]. This guideline becomes an initiative to decrease the fatality rates in the construction industry by 2020 [5]. Despite this, after more than a year being introduced, the number of projects that fully implements the guidelines is deficient. Hence, the purpose of this study is to determine the current OSHCIM practice in Malaysia construction industry.

2. Occupational Safety and Health in Construction Industry (Management)

These guidelines adopted from Construction Design Management (CDM) Regulations which to ensure each stakeholder in the construction industry have the same liability and self of belonging in their project [6]. Besides that, these guidelines advocate the minimum roles of every duty holders and stakeholders involved in the construction project from the beginning to its completion. Client, designer and contractor are among the duty holders mentioned, who has the responsibility to apply this practical guideline on the management of safety, health and welfare in carrying out the construction project [2].

2.1 Concept

The concept of OSHCIM is to design out the risk at the early stage, which apply the principle of *"who create the risk should manage the risk*". Hence, in order to practice this concept risk management approach and general prevention principle were carried out at the design stage, which known as Design Review Rule (DRR). The objective of design review is to identify significant risk, proportionately and lead to less unnecessary bureaucracy, better team working, and better project management encourages better quality and value for everyone. Design review includes analysing the relevant detail and working collaboratively with others to identify significant risks, mitigate their impact, record the significant findings and produce suitable information to communicate these measures proportionately [5]. Design review procedure covers the respective duty holder's role and shall go through three stages which are:

i. RULE 1: Concept Design Review

   Concept design review shall look into the overall project perspective including but not limited to site location, public access traffic, and type of buildings in the surroundings, landscape and other general constraints.

ii. RULE 2: Detailed Design, Maintenance and Repair Review

   Detailed design, operations, maintenance and repair review should look at a building's detailed architectural and structural design. The review should determine risks involved in the construction methods, access and egress, and whether the design will create confined space or other hazards. Risks related to maintenance and repair of a building, such as cleaning methods, should also be studied.

iii. RULE 3: Pre-construction Plan Review.

   Pre-construction design review should examine temporary works design and design by specialist contractors not covered during the concept and detailed design phases.

The adoption of the design review process to be conducted depends on the procurement method adopted for the project as depicted in Figure 1

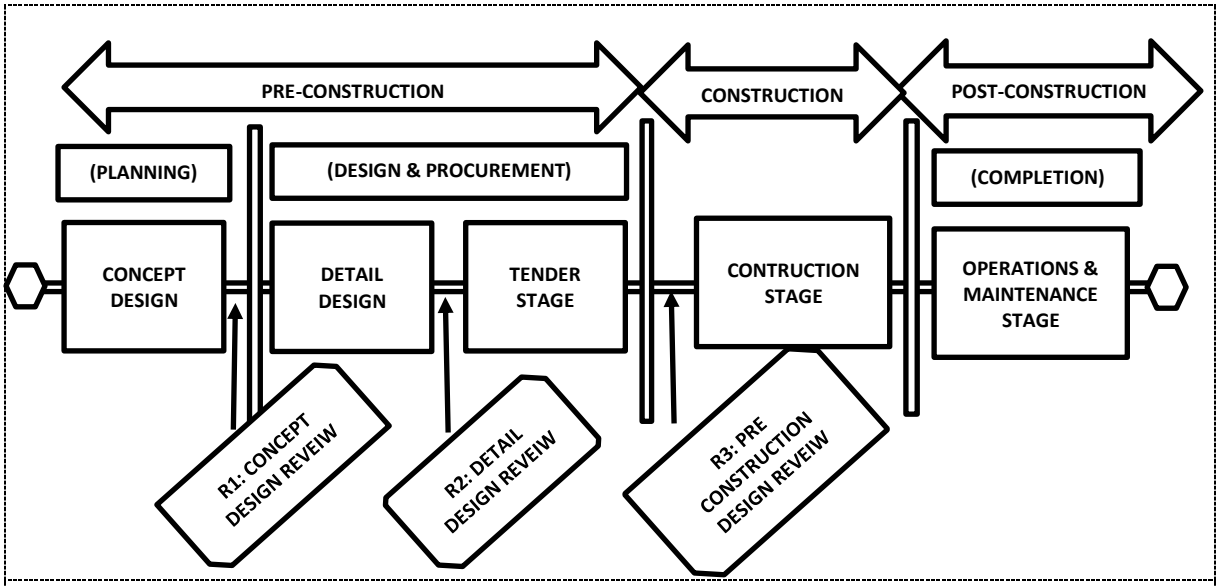

Figure 1. The design review process for traditional procurement.

2.2 OSHCIM Process

During the pre-construction stage, client and principal designer shall collaborate to provide adequate pre-construction information (PCI) that share to the principal contractor, designer and contractor. In the process of the design phase, the principal designer and designer must consider the PCI in their design work. The information will be passed on to the principal contractor for further action. Next, in the construction phase, the client will ensure the construction phase plan is constructed before this phase begins. The principal contractor draws the construction phase plan according to PCI given in an early stage with the help from the principal designer. In the same time in the process of the design phase and construction phase, the safety and health file are prepared by the principal designer. As stated in OSHCIM 2017 Guidelines, safety and health file is a file appropriate to the characteristic of the project, which covers on safety and health information being considered during post-project such as maintenance, cleaning, refurbishment, or demolition [2]. The file is needed when the project involves more than one contractor. Thus, at the end of the project, the safety and health file will be handed over to the client where the client needs to maintain the file and ensure it is available for any following construction or modification of work on the building.

3. Methodology

For this study, a set of questionnaire is developed. To ensure the reliability of items was determined pilot study was conducted and the value of the Cronbach's Alpha is 0.933. The main element in measuring the current practice of OSHCIM are Management, and Standard Operating Procedure (SOP) was used. The question was items based on the OSHCIM 2017 guidelines practice that supposed to be implemented in the construction project. 5 Likert Scale was used to measure the current practice, (1) Never, (2) Rarely, (3) Sometimes, (4) Very Often and (5) Always [7]. The one-way analysis of variance (ANOVA) was used to determine whether there are any statistically significant differences between the means between the construction stakeholders groups.

4. The current OSHCIM practice in Malaysia

In determining the current OSHCIM practice in Malaysia, three hundred (300) questionnaire form has been distributing. A total of 135 (45%) responses managed to be collected from the 300 respondents. The analysis of current OSHCIM practice was divided into three sections, as follows:

4.1 Demographic Analysis

From the 153 responses shows there was seven (7) type of profession as the construction stakeholders in Malaysia construction industry. The highest total number of the respondent was the Quantity Surveyors, 35 respondents from the overall. Then, followed by a second more substantial group of the respondent which was the Architects, 27 respondents. The third to fifth group was the Civil and Structural Engineers, 18 respondents, the Mechanical and Electrical Engineers with 15 respondents and the Contractor G1 to G7, 14 respondents from overall respondents. The sixth and seventh-lowest total respondents group was from the Client / Developer and the Safety and Health Officer (SHO) / Site Safety Supervisor (SSS) with the same total of 10 respondent. Table 1 shows the summary of type of stakeholder's profession.

Table 1. The summary of the type of stakeholder's profession

Type of stakeholder's profession	No. of respondent
Client / Developer	13
Architect	27
C&S Engineer	18
M&E Engineer	15
Quantity Surveyor	35
Safety Officer / Site Safety Supervisor	13
Contractor G1-G7	14

4.2 Management

Figure 2 shows the mean comparison between the construction stakeholders groups on the level of current OSHCIM implementation. The result shows the value of compare means according to the stakeholders' point of view. It can be clearly seen there was only one (1) mean score range of classification towards the current OSHCIM management practice among the Malaysia construction industry stakeholders. All stakeholder's mean score was within "Practice" range which was "3.667 < 5.00". It shows that the construction projects handled or owned by the stakeholders currently were practising the OSHCIM management practice. All stakeholders already have a written safety and health policy that express the organization's commitment to employee's health and safety. Besides that, they also share information on OSH with other workers and encourage them to establish ownership of safe behaviour. Moreover, they provide appropriate resources to ensure that the person responsible for OSH can perform their function effectively. All this practice have been highlighted in current OSHA and BOWEC practice. All requirement has been implemented such as (1) make arrangement to ensure that all persons are competent to carry out the safety and health aspect of their duties and responsibilities, (2) identify training needs and conduct training program for all member of the organization, and (3) setup an arrangement to monitor, measure and record the organization's OSH performance on a regular basis.

Current practice is similar to OSHCIM concept which to deal with hazard, the differences between current practice and OSHCIM is the stage of implementation. OSHA and BOWEC come after the project start. Meanwhile, OSHCIM starts at an early stage which during the design stage. Hence, in OSHCIM designer team need to responsible for the protection of the worker's safety and health and set up a communication system to spread OSH related information to everyone and effectively coordinate OSH issues with the construction team members. Therefore, at the design stage designer team will communicate risk though their design and risk register report to all stakeholders.

As a whole, these findings show that even though OSHCIM still new for the construction industry, all stakeholders already partially practice the concepts of OSCHIM. For the designer team, they already consider all this element but not adequately documented. OSHCIM through the design review process will verify their liability in reducing risk using a design approach.

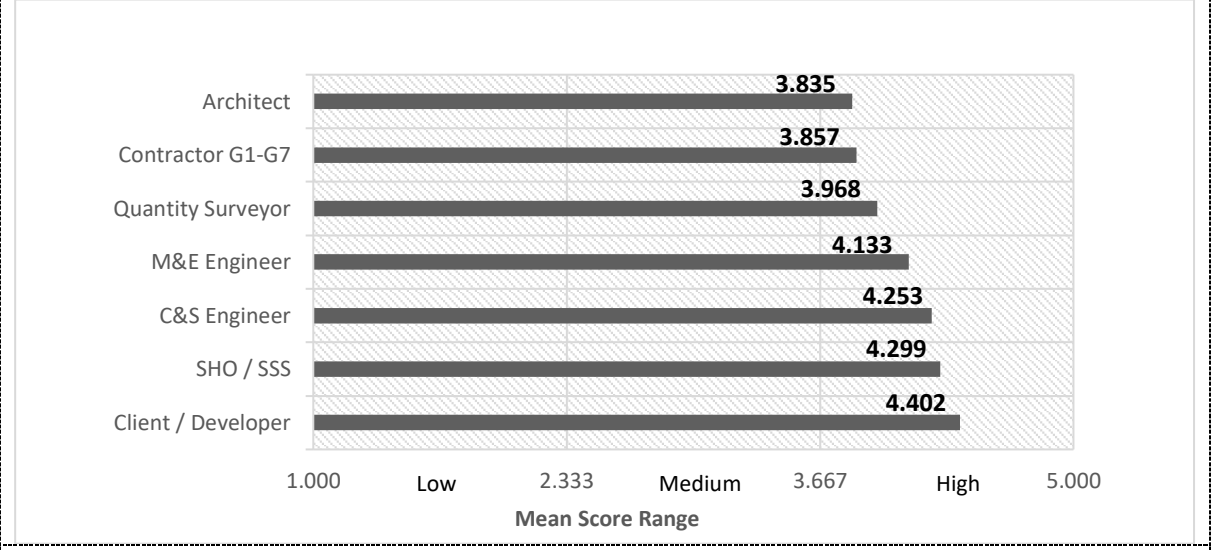

Figure 2. Compare means of current OSHCIM management practice according to stakeholders.

Due to the high level of OSHCIM current implementation among construction stakeholders' groups, ANOVA test was carried out. The purpose of this test is to determine whether there are significant differences among the seven groups of construction stakeholders' for the current level of OSHCIM implementation. For the purpose of this test null hypothesis is created to be tested.

Null Hypothesis : There is no difference between seven groups of construction stakeholders' for the current level of OSHCIM implementation

Table 2 shows result from one-way ANOVA test that the seven groups of construction stakeholders for current level of OSHCIM implementation [F (df = 6, 128, p <.001) = 2.093]. The findings show that the value of (F=2.093) is higher than (p = .001). The null hypothesis is accepted. This means that there are no significant differences between groups of construction stakeholders for the current level of OSHCIM implementation.

Table 2. ANOVA test for the current level of OSHCIM implementation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.246	6	.874	2.093	.058
Within Groups	53.464	128	.418		
Total	58.710	134			

4.3 Standard Operating Procedure (SOP)

Descriptive statistics with a mean score between the groups of construction stakeholders' shows, as reported in Figure 2. The results show the mean score ranking starts from the "Contractor G1 – G7" with the lowest mean score of 3.643, followed by the "Architect" with 3.847 mean score, the "Quantity Surveyor" with 3.849 mean score, the "Mechanical and Electrical Engineer" with 4.067 mean score and the "Civil and Structural Engineer" with 4.175 mean score, the "Client and Developer" with 4.209 mean score and the "Safety and Health Officer / Site Safety Supervisor" with the highest mean score of 4.286.

These findings show the current practice in terms of documentation and standard operating procedure are practice by construction team project, which are Safety and Health Officer / Site Safety Supervisor, Client and Developer and Engineers. Meanwhile, for others, the documentation and SOP fall under medium level for practice. This is due to the nature of current construction working environment which in managing safety and health during construction stage fall under Safety and Health Officer / Site Safety Supervisor liability. Hence, through OSHCIM all stakeholders need to prepare documentation such as Client Brief, Pre-Construction Information (PCI), Construction Phase Plan and all related documentation to be included in Safety Health File.

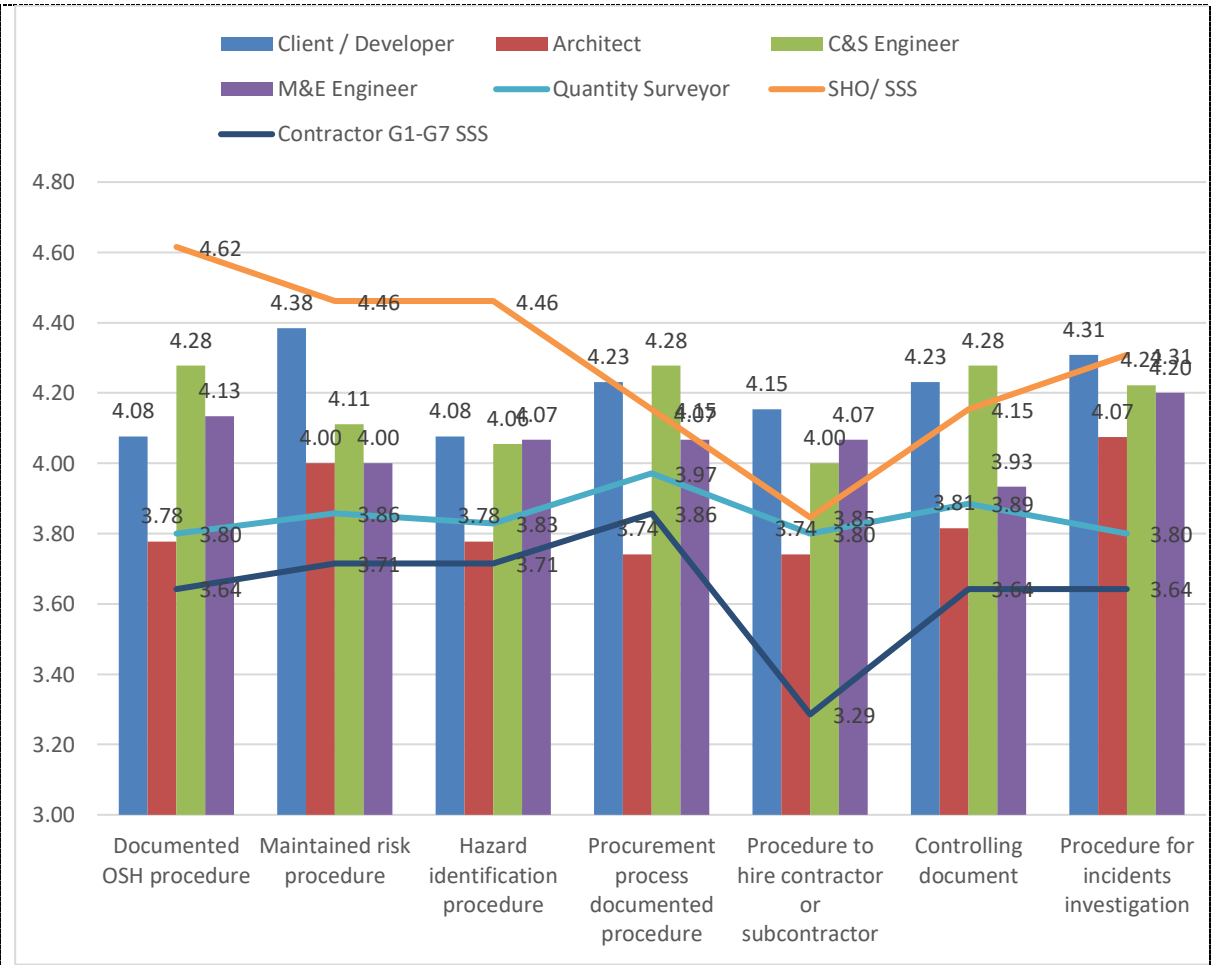

Figure 3. Compare means of current OSHCIM SOP practice analysis according to stakeholders.

5. Conclusion

The current OSHCIM practice in Malaysia construction industry was found to be "Practice" among the construction stakeholders in their construction projects. The OSHCIM management element items such as written policy, OSH information sharing, the responsibility of the project team, OSH communication system, monitoring arrangement, training programs, duties competency and self OSH awareness were among the management practices that have been analysed and currently being implemented in the construction industry by the stakeholders. On the same hand, the standard operating procedure (SOP) element items such as documented OSH procedure, maintained risk procedure, hazard identification procedure, procurement process documented procedure, the procedure to hire contractor or subcontractor, SOP for controlling document and procedure for incidents investigation were also currently being implemented in the construction stakeholders.

Acknowledgements

This article is part of the on-going industrial project on OSHCIM implementation with funding provided by the Construction Industry Development Board (CIDB), Malaysia and Department of Occupational Safety and Health (DOSH), Malaysia.

References

[1] Shaffii, N. (2017). Construction Industry Transformation. *ECoTMPA 5th National Workshop 2016 on Construction Industry Transformation*, (September), 1–35.

[2] DOSH. (2017). Guidelines on Occupational Safety and Health in Construction Industry (Management) 2017.

[3] DOSH. (2016a). *Fatal Accident Case*. *Department of Safety and Health Malaysia*. Retrieved from http://www.dosh.gov.my/index.php/en/component/content/article/352-osh-info/accident-case/955-accident-case

[4] Mohd, N. I., & Ali, K. N. (2014). Addressing the Needs of Gaming Approach in Hazard Identification Training. In *2014 International Conference on Teaching and Learning in Computing and Engineering* (pp. 212–215). IEEE. https://doi.org/10.1109/LaTiCE.2014.48

[5] Barker, M., & Casey, S. (2012). Safety in Design. *Fourth International Conference on Water Resources and Renewable Energy Development in Asia*.

[6] Summerhayes, S. D. (2016). *CDM Regulations - 2015 Procedures Manual* (4th Revise). United Kingdom: Wiley-Blackwell.

[7] Brown, S. (2010). Likert Scale Examples for Surveys. *Iowa State University*. Retrieved from http://www.extension.iastate.edu/ag/staff/info/likertscaleexamples.pdf

[8] DOSH. (2016b). *Occupational Accidents Statistics by Sector*. Kuala Lumpur. Retrieved from http://www.dosh.gov.my/index.php/en/archive-statistics/2015/1713-occupational-accidents-statistics-by-sector