



A Review on the Implementation of Construction Safety Management System in ASEAN Development Projects

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Abstract: Many countries have focused on emphasizing the importance of construction and health safety management. Countries such as Indonesia, Hong Kong, Malaysia, Vietnam and Cambodia are looking into this issue seriously in order to ensure that the construction industry will always have a positive reputation. The implementation of construction safety management system is very much related to the government policies in construction, the roles of the government agencies, consultants and contractors. This is much more important when many countries are rapidly focusing in developing their facilities and infrastructures towards achieving modern and advance life style community. The rapid emerging economies during this rapid development have created a situation whereby numerous occupational deaths, injuries and illnesses were accounted for among the construction industrial players. Thus, this paper reviews the implementation of construction safety management system in selected countries such as Indonesia, Hong Kong, Malaysia, Vietnam and Cambodia based on projects and experiences by researchers and industrial players from those countries. From the review process, it was found that almost all ASEAN countries are practicing safety and health management system in construction as it is important in all aspect of avoiding possible accidents and fatalities at construction sites. In conclusion, it can be mentioned here that the implementation of construction safety and health management system is an instrument which can be useful not only to avoid accidents and save lives but, it may also enhance the quality of work and outcomes in the construction industry.

Keywords: Safety and health management, construction industry, ASEAN countries

1. Introduction

Many countries including Malaysia and Indonesia are taking safety in construction seriously. Construction safety management system is a protection system provided to ensure the human resource in the construction industry will experience low risk in terms of safety and health impacts. In many countries including Indonesia and other ASEAN countries, policies and procedures pertaining to this safety aspects are being designated and implemented as a monitoring & enforcements instruments for the construction industry [21]. For example, Indonesia has provided these requirements in the Peraturan Menteri Tenaga Kerja Nomor: PER.05/MEN/1996, Peraturan Menteri PU No. 9 Tahun 2008 which mentions the Safety and Health Management System (SMK3) for general construction and PP No. 50 Tahun 2012

pertaining Implementation of Safety and Health Management System [20]. Malaysia has also its ministry to look into this matter. In other countries such as Malaysia, Vietnam and Cambodia, the construction safety and health requirements are designed as per their locality conditions especially in this era of COVID19 pandemic situation. The usual practice and enforcements of conducting works on construction site are being changed to suit the 3W approach that is **Wash, Wear and Warn** while also ensuring we follow the 3C that is avoid **Crowded places, Confined spaces and Close conversation**. These are the new normal that we have to adhered in the construction industry while conducting our responsibility. In this paper, discussions on the basic and fundamental concepts such as safety and health principles, safety and health management system, implementations of safety management system in Hong Kong, Norway and ASEAN countries with some comparisons were conducted [18]. Thus, it is expected the findings will enable the relevant parties to pick-up some valuable information to enable the appropriate execution of construction safety and health management systems in projects and other relevant applications [19].

2. Methodology and Review Process

The review process on this subject matter is conducted with the aim to identify and analyze the safety factors which are involved in the construction industry in ASEAN countries with some selected case studies. It also aims to identify the status of managing construction projects based on the safety and health management system, which are common and being a priority in developed countries. In this paper, comparisons between ASEAN practices, Middle East and selected European countries are being conducted. The reasons for these comparisons are to discuss and analyze the differences and contributing factors to construction safety and health management. As an example, Table 1 demonstrated some causes of poor construction safety performance in developing countries which resulted in construction accidents.

3. Safety Concepts and Principles - An Overview

The theory behind construction safety and health is based on three main elements which are latent errors, mindfulness and organizational resilience. According to Nicole et al (2018) and Patrick Manu et al (2018), conceptualized latent errors are events, activities or conditions that deviate from expectations in ways that may or may not cause adverse consequences of organizational significance. These expectations are expressed through rules, regulations, procedures and so forth which are usually formulated by authorities to control, monitor and enforce implementations of the related construction activities whether it is high-end budget construction or low-cost housing construction [33]. Whereas, mindfulness describes the sensitivity showed by all parties involved in the execution and monitoring of the activities such as that conducted in the construction industry. The sensitivity to operations principle is understood as the awareness of the situation or conditions surrounding a particular operation or process [22]. Thus, this mindfulness concept and associated principles imply ways of thinking and organizing that have a higher likelihood of revealing unexpected events. One approach will be public-private partnership [23].

It also implies vigilance, monitoring and corrective actions as connected to latent errors. Lastly, organizational resilience is the third concept which describes on the development of short-term business continuity and long-term disaster recovery planning. This aims to strengthen the organization's ability to cope with disruptive events, which we have seen during the current COVID19 pandemic. The key to this planning is principles such as robustness, redundancy, resourcefulness and rapidity. Robustness means ability to withstand stresses, demands and pressures with succumbing to damages [18]. Whereas redundancy concerns on the organization's ability to establish a system that meets the functional requirements in the event of disruptions or loss functionality. Resourceful refers to the organization's ability to identify problems, establish priorities and mobilize resources in order to avoid or cope up with disruptions or damages to meet priorities and achieve targeted goals. Finally, Tierney (2003) defines rapidity as the ability to meet priorities and achieve goals in a timely manner. This concept is found similar as ones adopted by the Japanese community; The JIT approach or Just-In-Time approach.

As stated by many including May et al (2019), safety prevention measures need to be assessed as usually done in traffic, whereby the risks in construction projects should be calculated in order not to jeopardize the lives of workers [14][25].

4. Importance of Safety and Health Management - A Review in Indonesia

The safety issues are not only in traffic matters but also in construction industry. Rahman et al (2019) reported on issues pertaining traffic safety in Malaysia. Fatalities are reported daily, not like in construction industry. However, in case of implementation of construction safety management system in Indonesia, it is part of the Construction Safety Management System Framework or SMKK, which is expected to ensure workers safety [20]. These aspects are important especially when time optimization in projects is concerned [27][21]. There are five (5) main aspects those were determined and considered in the implementation of SMKK in Indonesia. Among others are:

- (a) **Leadership and participation of workers in construction safety**
Workers are involved in the discussion of construction safety. Workers and leader should always interact and concern on construction safety. They must also be committed in implementing construction safety while consulting each other occasional.
- (b) **Planning of construction safety**
Some of the elements that should be considered are hazard identification, risk assessment, controls and opportunities. The issues considered will be internal and external impacts. Apart from the above, identification and determination of needs and expectation of interested parties should be considered with risk control planning and determination of action plan.
- (c) **Support in construction safety**
Resource, competence, concerns and communication are the main important elements in construction safety support. Documented information will be the outcomes of this support which will be disseminated to all in the organization.
- (d) **Construction safety operations**
This includes construction safety planning, elimination of hazards and reduction of construction safety risks and operation control. During emergencies, readiness and response will be crucial in ensuring operations are efficiently and effectively conducted.
- (e) **Evaluation of construction safety performance**
There are three (3) elements in this aspect which are monitoring and evaluation, improvement of construction safety performance and conducting management review.

5. Safety and Health Management System in The Construction Industry - Models and Causes

The construction industry is one of the pillars in national and community development. The improvement of community well-being depended on the economics and the life standard of the population. Thus, even though the construction industry is considered as one of the most dangerous industries in the world [34] which has resulted in the highest number of occupational injuries and fatalities in the past years, but the establishment of policies and procedures have made the industry more sustainable and safer in terms of site execution and site fatalities cases. This fact is shown by the research conducted by King and Hudson conducted in 1985 (As mentioned by [34]) which revealed that fatalities in developing countries are three times higher than in developed countries. This is further affirmed by [3] when they conducted the research on construction fatalities rate in middle eastern construction industries and found that 18.6 per 100,000 workers experience accidents which also includes fatality compared to developed countries rate of approximately 4.2 per 100,000 workers. When considering safety and risk management in construction, [22] studied work accidents in loading and unloading of container activities which focused on workers safety. Likewise, a study on implementation of safety construction in bridge construction in Indonesia was conducted by [1]. Among the causes of construction industries poor construction safety performances in developing countries are as shown in Table 1.

This table demonstrates the possible causes of safety performance in the construction industries which are reported in several countries as per the literature research conducted by [34] done by several previous researchers, among others are from Hong Kong, Saudi Arabia, Uganda, Pakistan, South Africa and Kuwait. It can be summarized from Table 1 that absence of safety officers, ineffective laws and lack of enforcement, poor accident record keeping plus lack of management commitment to safety budget allocation have contributed to the construction industry accidents, directly and indirectly [12]. Further findings from this research is being discussed in section 6 of this paper.

Safety and health management is an important step in ensuring safety and health is systematically managed within an organization [24][8]. The International Labour Organization (ILO) describes this as a set of interrelated and interacting elements to establish the Occupational Safety and Health (OSH) policy and objectives and at the end an instrument to achieve those objectives [15]. There are several safety and health management system in the construction industry [9]. It can be said that the Safety and Health management systems which were developed remarkably from early 1990s, were based on two main streams [16]: (a) The development of laws which required systematic Safety and Health management framework directives and, (b) The introduction of some Safety and Health management models (such as BS OHSAS 18001) as mentioned by [6]. Amongst the prominent Safety and Health Management System (SHMS) or models are the HSE or Health & Safety Environment (1997, 2013, 2014), British Standard BS OHSAS 18001:2007 (BSI, 2007) and the International Labour Organization [16]. These models comprised of the following elements [10][11][13]: (Refer Table 2).

- (i) **Policy** which is a general statement and overall guiding principle regarding safety and health of an organization
- (ii) **Organization** which covers the roles, responsibilities and provision of resources within an organization to effectively control the safety and health issues
- (iii) **Planning and implementing** which include goal-setting and operating the system
- (iv) **Measuring performance** means monitoring implementation to ensure that the set targets are achieved
- (v) **Review performance** is the element covers the procedures to ensure that the organizations learn from experiences to improve the performance
- (vi) **Auditing** is the process of monitoring overall system to ensure its effective function through continuous improvement process.

Table 1 - Causes of poor construction safety performance in developing countries (Source: [34])

Poor safety performance caused by	Reported in	According to
Extensive subcontracting	Hong Kong, Kuwait, Uganda	Wong & So (2002), Al-Humaidi & Tan (2010), Irumba (2014)
Absence of adequate safety training	China, Saudi Arabia, South Africa	Tam et al (2004), Teo et al (2008), Zou & Zhang (2009)
Ineffective laws and lack of enforcement	Honduras, India, Malawi, Jordan	Recarte Suazzo & Jaselskis (1993), Chiocha et al (2011), Alkilani et al (2013)
Lack of management commitment to safety budget allocation	Kuwait, South Africa, Malawi	Kartam et al (2000), Teo et al (2008), Chiocha et al (2011)

6. A Review on Hong Kong Safety and Health Management System in The Construction Industry

This case study is the safety practitioner’s perspective on the implementation of safety management systems in Hong Kong [29]. According to them, the safety management system (SMS) for the construction industry in Hong Kong was introduced in the 1980s in order to mitigate against workplaces hazards, reduce the risk of injuries and minimize property damages. It was also found that the SMS was later improved with the introduction of the Factories and Industrial Undertakings Regulation (Safety Management) in 1999 in order to empower the mandatory implementation of the SMS in certain industries including building construction. Based on the review made by [29][30], it was found that the state-of-the-art practice and structured interviews indicated that visible senior commitment, in terms of manpower and cost allocation, and competency of safety manager are key drivers for the success of implementing the safety management system. Accident rates and accident costs were reduced, organizational framework was improved and safety audit rating was increased [2]. These are the identified core benefits when successful implementation of SMS was conducted. These findings were consistent and indicative of the future and long-term development of safety management practice and the sustainable safety improvement of the Hong Kong construction industry.

Table 2 - Key elements of safety & health management (Source: [34])

Management Area/Element		Description/Examples
Plan	Policy Planning	Written In-House Policy & Planning effective implementation (pre-project)
Do	Risk Assessment Organising Implementation	Evaluation of risks & establishing measures plus structural system. Conduct actual implementation.

Check	Measuring & Reviewing performance	Verification of goals & achievements. Conduct investigation of near misses of accidents.
Act	Auditing	Reviewing the entire system to ensure continuous improvement.

7. Reviewing Middle East Countries Safety and Health Management System in The Construction Industry

A study on construction safety practices and challenges by [34] as discussed earlier in section 4 of this paper indicates the case in Middle Eastern developing countries. As construction risks are high and worker-hazard interactions are inevitable, safety systems have been developed to prevent injuries and accidents [17]. In this study, it was also found that unlike in developed countries which have invested significant efforts to devise extensive in safety standards which aimed to produce zero injuries policies, construction safety in developing countries are still in its infancy. Table 3 shows the comparative study conducted by the researchers between developing and developed countries based on the implementation and enforcement of the Safety and Health management system. The table demonstrated the difference in mindfulness and commitments at the execution and the top management levels of the companies who are involved in the construction industries.

Based on the survey results conducted among companies with and without Safety and Health Management System (SHMS), the researchers have found that eight out of fifteen (53%) companies were found to have SHMS in place. The survey also found that the main characteristics of an occupational safety health system as identified by the respondents include onsite safety signage, provision of PPE, toolbox meetings, workers’ training, regular site inspection by dedicated safety personnel, accident documentation and investigation. Some companies have neglected the participation of workers in setting safety standards and accident investigation, creating safety compliance incentives, presence of a nurse onsite, testing for drugs and alcohol abuse and sub-contractor selections (where it involves technical safety requirements). The opinions of consultants as respondents in the survey pertaining to safety implementation (SI), safety standards (SS) and inspection frequency (IF) are as shown and validated in Figure 2.

Table 3 - Comparisons of construction safety behaviour between developing & developed countries [34]

Safety Performance Gap	Developing Countries	Developed Countries
Training, Competence and awareness of workers	Workers are not aware of their rights, do not understand the necessity of safety and receive little or no training	Higher worker competence level and adequate training for all workers
Top Management commitment	Extensive subcontracting and unsupportive top management	Management commitment to safety through regular supervision, proper safety budget allocation and initiation of comprehensive safety programs
Safety regulations and enforcement	Labor safety laws are either non-existent, or enacted but, not enforced, or implemented to a limited extent and coverage	Health and safety regulations enacted, monitored and firmly enforced such as the OSHA standards

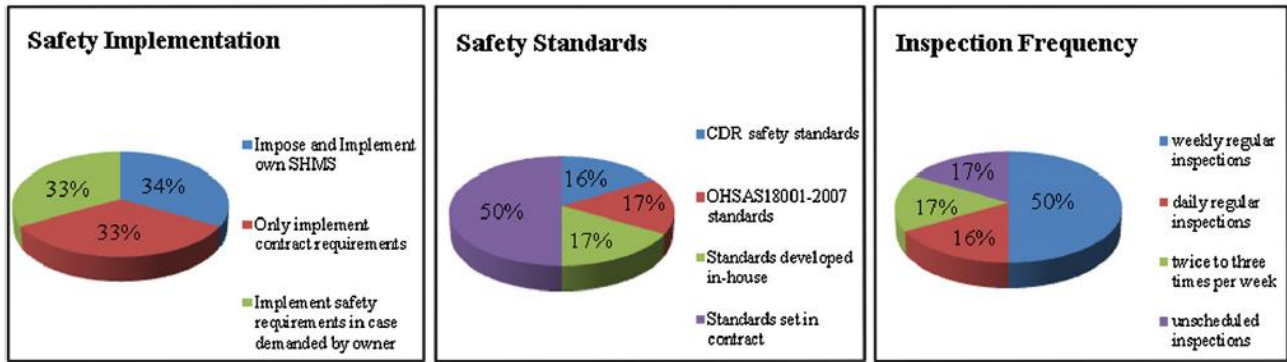


Fig. 2 - Consultants' survey results regarding safety implementation, standards and inspection frequency (Source: [34])

8. Discussion on Safety and Health Management Practices Among Contractors in ASEAN Countries

Tragic consequences and fatal accidents due to negligence and low safety considerations are not uncommon in the construction industries. In many countries including ASEAN countries, which are considered emerging economies, such as Malaysia, Vietnam and Cambodia, there are limited research evidence about the extent of implementation of safety and health management by contractors and consultants. The research conducted by [30] on health and safety management practices of contractors in ASEAN countries focusing on Malaysia, Vietnam and Cambodia has unveiled the importance of contractors giving priorities to safety and health in construction activities. This will be useful as the ASEAN region of 11 countries which are also known as a new generation of 'Asian Tigers', represent an estimated construction market of circa US\$350 billion, which is twice the output of the UK construction sector in 2013 with an annual growth of over 6% [35]. Thus, given the outlook of construction safety and health performance in the ASEAN region the forecasted growth in construction is seen to have a direct relationship to reducing construction accidents, injuries, and illnesses and reduces the potential delay in construction projects. If the safety and health management issues are not handled appropriately, it may also hurt the credibility and reputation of the construction industries in the ASEAN regions especially in Indonesia, Malaysia, Vietnam and Cambodia. As discussed in section 4 of this paper, the six (6) elements of HSE model have the composition that might enable the success of implementing safety and health management system in the construction industry in ASEAN countries mentioned above.

Based on a research in Indonesia titled implementation of safety and health management system in RSUD Sunan Kalijaga development project in Cetrnal Java, which is aimed to evaluate the implementation of SMK3 in a project in the construction of General District Hospital Sunan Kalijaga, Demak, Indonesia, 45 respondents who have answered the questions given to them have unanimously agreed that the project was implemented with good practice safety and health management system at the planning, management and completion of the project development [19]. The research has also noticed that there is low risk potential to accidents among workers as the SMK3 was executed at an exceptionally good manner [20].

Fern et al (2019) also conducted the research on PWDs needs in buildings which were considered important in building safety. The research conducted has found that the feedbacks from selected micro-medium firms gave responses based on the distributed questionnaires. It appears that in all the countries, there are greater emphasis amongst contractors on punishing bad safety and health (S&H) behaviour that rewarding good behaviour. Malaysia has been found to give low emphasis rewarding good S&H together with Vietnam and Cambodia. In contrast, the level of implementing punishment due to bad S&H behaviour differs with Vietnam at moderate rating together with Cambodia and Malaysia is at low rating. However, even so Malaysia is found to be at low rating, the actual percentage is close to 48.3% which is quite close to the moderate category. Based on the overall results and analysis, it may be concluded that in terms of implementation of S&H management practices by contractors, Vietnam can be rated better than Malaysia and Cambodia [7]. However, based on the facts on fatality and accident rates collected by [3] with figures of 28.3% and 21,157 workers (for Cambodia), 27% and 20,605 workers (for Vietnam) and 18.3% and 14,000 (for Malaysia), it may suggest that S&H in Malaysia should be better in Malaysia, Vietnam and Cambodia respectively. Thus, this study gave an insight of the difference of construction industry environment and existing policies may have significant impacts on the implementation of S&H management system in a country thus, contributes towards construction and safety numbers among contractors and workers [21].

9. Discussion and Conclusions

In conclusion, based on the four case studies reviewed, it was found that the implementation of safety and health management system in construction is important to avoid or to reduce the possibility of construction accidents and

fatalities. The conceptual management approach of Policy, Organization, Planning & Implementing, Measuring Performance, Review Performance and Auditing are the key elements to safety and health management framework. These elements are in line with the management area of Plan, Do, Check and Act. According to [5], when there is disputes there will be a need of appropriate investigation and negotiation. The management of information is also crucial in ensuring construction safety is implemented appropriately. Thus, all countries should establish policies and procedures to implement and enforce S&H management system in the construction industries and not only penalize violator to S&H but also give merits or rewards to contractors who implemented S&H management system in their respective construction projects not only for building construction but also for highways projects [31]. This is hoped to motivate them whilst avoiding damages and disastrous incidents to the workers, projects, environment and the community, at large.

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