

Doctoral Thesis

Shibaura Institute of Technology

**A Comparison of Construction Safety and Health Management
between Japan and Malaysia: Assessment on the Safety Training
Methods Focus on Workforce**

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Tan Zi Yi

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Abstract

The construction industry has a strangely high rate of recorded accidents in developed and developing countries with 5%-10% of workforce employment but involves about 30% of all occupational fatal accidents worldwide. Several studies have revealed that most accidents associated with construction undertakings were attributed to a lack of proactive and preventive measures such as workforce training, risk source identification and control, safety awareness and education, inspection and so on. The study explores the similarities and differences focused on the construction safety and health management between developed and developing countries. This is a broad study; therefore, this study is divided into two parts to better present the extent of similarities and differences between Japan and Malaysian in terms of construction safety and health management over the past decades. Firstly, the study discovers the thematic settings of a comparison of safety and health management in the construction industry between Japan and Malaysia. Japan's safety and health involvement of government and builders is far more comprehensive than in Malaysia, in terms of ordinance, guidelines, education, major and minor safety and health related activities, government resources such as subsidies, and historical updates to monitor the construction safety related issues and provide solutions. The Japanese government has revised the guidelines several times to adapt them to the development of the construction industry and intend to make the guidelines better available for use by the contractors. On the contrary, the guidelines are minimally in line with the international standards, rather than being "tailored" to the culture and development of the Malaysian construction industry. The current use of the Occupational Safety and Health Act does not raise the level of awareness and practicability in Malaysia construction industry where the penalty is way too low whereby the current maximum is not a deterrent which causes the importance of safety to be trivialised or disregarded. Therefore, a strong enforcement by the government is necessary. The findings show that there is significant difference in micro perspective towards safety in construction between both nations. The contractors in Malaysia's construction industry are not too responsive to the programme initiated by the government as the current Malaysian construction industry is restricted by the low-wage and low efficiency due to the extensive dependence on low-skilled or unskilled foreign workers, the critical barriers to implementing OSH practices on construction sites in Malaysian context were identified as lack of budget allocation for OSH programme, prioritisation of production over safety and lack of effective communication. In contrast, the Japanese main contractors are committed to enforcing

the regulations relating to site safety and are involved in almost all safety precautions and willing to take voluntary initiatives to improve the safety issues including the safety education for construction foreign workers. The foreign construction workers are less satisfied in terms of their ability in communication skills, low level of safety knowledge and safety awareness regardless of their nationalities due to different cultural and language barriers. Therefore, from the perspectives of government agencies and construction site personnel, the safety training must not be neglected among the foreign construction workers.

Secondly, the study explores a preliminary study on the effectiveness of safety training methods towards construction workers and novices in the building construction industry. An early phase of viewpoint on the effectiveness of verbal and non-verbal safety training materials through the assessment between different levels of education background, nationalities and field experiences of students and foreign workers in Japan and Malaysia were studied. The teaching contents were selected based on the high frequency of high-risk activities on construction sites. The findings discovered the different attitudes between the foreign workers who work in Malaysia and technical trainees who work in Japan. Japanese construction novices showed similar attitudes among themselves toward unsafe actions within the safety training contents. In contrast, the Malaysian construction novices tend to be ambivalent where they might not have sufficient knowledge to recognize the unsafe actions on sites. The technical trainees who work in Japan showed more accurate responses in scenario questions than the Malaysian foreign workers who showed poor safety attitudes to several scenario questions due to different safety cultures, working environment and lack of proper construction safety education. In terms of the effectiveness of the training method, the non-verbalized method provides a stronger impression of the level of danger to the respondents than verbal methods that make interested in what is being explained and transfers the related safety knowledge to the construction foreign workers and construction novices. Verbal materials are useful for native workforces while non-verbal materials will be useful for foreign workforces if there are language problems as there is no difference in understanding between verbal and non-verbal materials for foreign workers. This study could be used as references for the related educators and policy makers of safety education programs to design the teaching methods for high-risk activities so that workers from different backgrounds, with or without field experience, can learn effectively. For recommendation, further customised training content for high-risk activities is necessary to suit the site safety culture in the Malaysian construction industry.

Chapter 1 Introduction

This chapter reviews the history, laws and regulations, policies and the current construction safety management practices, and the relationship between the number of accidents and casualties in the management of construction site safety by the Japanese and Malaysian governments and relevant sectors of the construction industry. Interestingly, the information above obtained from the Japanese and Malaysian government and related authorities were different in terms of the level of detail in the presentation of information. For instance, Japan has comprehensively introduced policies and programs formulated and promulgated in previous years, with detailed records, investigations and presentations on the number of casualties, accidents, disasters events which have been standardised among each sectors by industry; whereas the Malaysian government, although it has introduced relevant policies and program that include all industries, has not comprehensively introduced all the years since independence, nor have the relevant sectors conducted all accidents or incidents with detailed reports and investigations by the relevant authorities, and even some accidents are known only through the press or unofficial media. The comparison shows the similarities and differences between the two countries in terms of construction safety strategies, policies and programs. This chapter also covers the issues related to the safety of construction site personnel in both countries. Information and data were obtained from official sources and public websites and are used for academic purposes only. In case of any change in data or information, the official media of both countries shall prevail.

1.0 Research Background

According to the Oxford dictionary, safety is the condition or state of being protected and safe from danger or harm, while, health is the state or condition of a person's body or mind free from illness or injury. The concept of management systems is used in any decision-making processes in business made by the company or organisation, whether it is the change of business direction or simply the purchase of equipment or new furniture (International Labour Organisation, 2011).

The construction industry is a pillar of the country's economic growth with a 5-7% contribution of the total Gross Domestic Product (GDP) (Alaloul et al., 2021). With the global construction output forecasted to increase approximately 43% to US dollar of 13.9 trillion by 2037 (Global Construction Future and Oxford Economics, 2023). The construction industry's output is relatively small compared to other industries, but the construction market has been progressive opening along with globalisation. Globalisation has led construction companies to become the contributor of the global economy. In view of the Malaysian "Look East Policy" was an economic policy announced and advocated by former Prime Minister of Malaysia, Tun Dr. Mahathir Mohamad in 1990s, who recommended an initiative to learn from the experiences, skills and techniques in various fields of Japan in the nation-building of Malaysia and to improve the relationship between Japan and Malaysia.

In this regard, this study will be directed towards the "Look East Policy", which will be used to explore how the Japanese construction industry can effectively control, minimise, enhance, promote and maintain safe practices on construction sites, and how to educate construction site workers to maintain effective and safe practices on a daily basis. Japanese construction companies entered into Malaysia in the 1970s and accelerated the "Look East Policy" in the 1980s has a tremendous vitality with the positive commercial growth since then (Ibrahim et al., 2010; Asan and Akasah, 2014). The construction of significant projects such as airports, infrastructures, industrial and commercial facilities in Malaysia were involved by Japanese general contractors. These remarkable building facilities and infrastructures have important implications for the knowledge and technology transfer such as disaster prevention methods held by Japanese general contractors (White Paper on Land, 2006).

Taking into account of the economic development and workforce employment, the construction industry has a strangely high rate of recorded accidents in developed and

developing countries with 5%-10% of workforce employment but involves for about 30% of all occupational fatal accidents world widely (International Labour Organisation (ILO), 2015; Buckley et al., 2016). As the economy grows, construction industry has been considered to own high injuries and high fatalities rates among all the industries worldwide due to its characteristics of the projects and the nature of the activities in daily basis (Hino et al., 2011; Aminbakhsh et al., 2013; Andolfo and Sadeghpour, 2015; Sousa et al., 2015). Obviously, the workers' health and safety are not yet understood as an integral part of public health (ILO, 2001a).

The Southeast Asian region is one of the key dynamic areas to drive the world economy. This region is composed of 11 countries namely Brunei, Cambodia, East Timor, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam (Asia Society, 2023). Southeast Asia has an overall economic growth rate higher than the global average; it can be said that it is one of the key drivers of future global economic growth (Kuusinen et al., 2020; Murphy, 2023). Some of the Southeast Asia countries namely Indonesia, Philippines, and Vietnam known as a new generation of “ASEAN Tigers” which possess the fastest growing construction market globally supported by a strong fundamental (Kuusinen et al., 2020; Global Construction Future and Oxford Economics, 2023). The South-East Asia infrastructure construction market size will be valued at US dollar 209.3 billion in 2023 and is estimated to grow at a compound annual growth rate (CAGR) of 6.1% to US dollar 254.8 billion in 2026 (Global Data, 2023). According to the Southeast Asia Construction Industry Report 2022 prepared by Cision PR Newswire (2023) and the RICS Asia-Pacific construction sector insights Q2 2022 (Royal Institution of Chartered Surveyors (RICS), 2022), the development of construction is expected to continue to grow rapidly. Despite the grow of economy in the region, previous studies in 2006 indicated the occupational fatalities rate (per 100,000 workers) of 10.0 in Brunei, 28.3 in Cambodia; 20.9 in Indonesia; 28.8 in Laos; 18.3 in Malaysia; 26.0 in Myanmar; 20.0 in Philippines; 9.8 in Singapore; 23.3 in Thailand and 27.0 in Vietnam (Hämäläinen et al., 2006). The fatality rate is considered low for Brunei and Singapore compared to the fatality rate of the rest of the countries. While the lower fatality rate in countries such as 0.8 in the UK, 3.2 in Japan and 5.2 in the United States (Hämäläinen et al., 2006). The National Statistics Office of Thailand states the construction industry poses the highest risk of major injuries and fatalities to workers among all other industries. There were 9,725 construction workers reported for industrial accidents, 9,148 were injured, 47 were permanently disabled and 80 were found dead (Vongpisal and Yodpijit, 2017). The

occupational injuries contributed to the direct cost associated with the payment of workman compensation claims for medical care and health services (Daniell et al., 2007). The situation does not significantly change much in these countries after decades of economic development.

In developing countries such as Malaysia, the accident rate per 1,000 workers recorded 5.84 in 2004 reduced to 2.18 in 2020; while the fatality rate per 100,000 workers remained in the range of 4.64-4.14 between 2012 to 2018 and reduced to 2.09 in 2020 (Department of Statistics Malaysia, 2021). However, the construction fatality rate holds 6.90 in 2020 which is the highest among all industries in Malaysia (Department of Statistics Malaysia, 2021). In developed countries such as Japan, the accident rate per 1,000 workers recorded 2.75 in 2000 reduced to 2.33 in 2020; the fatality rate per 100,000 workers recorded 3.98 in 2000 reduced to 1.49 in 2020; the construction accident rate recorded 6.27 in 2000 reduced to 4.48 in 2020 (Japan Industrial Safety and Health Association (JISHA), 2020). Both countries encountered a high fatality rate in the construction industry. The prevention of construction accidents (Hino et al., 2011; Hoła and Szóstak, 2014; Lee et al., 2016) and challenges faced by the construction industry (Ismail et al., 2018) were identified. However, the nature of the construction industry which involve various types of high-risk activities in daily basis (Aminbakhsh et al., 2013), working environment (Hoła and Szóstak, 2014), that caused by lack of safety knowledge, awareness, supervision (Ayob et al., 2018; Abukhashabah et al., 2020) and the involvement of labours especially in developing countries remaining unsolved.

Workplace safety is always an attentiveness topic among policy makers and academicians (Vignoli et al., 2014). Occupational safety and health (OSH) are one of the important aspects (Fan et al., 2020) in the construction industry as it is considered as one of the construction project success criteria to ensure the construction project quality (Konno, 2018). Construction industry is always dealing with the triangle of cost, time and quality where researchers suggested that safety and health is one of the vital criteria toward construction project performance (Hasan and Jha, 2013).

Safety management is a method of manipulating on-site safety policies, procedures, and practices relating to a construction project, which is one of the most frequently leveraged techniques to regulate construction activities and control risks (Zhou et al., 2013). The reasons to have an effective safety management system on construction sites, where it is a legal responsibility for contractors to protect, promote and maintain secure working conditions, while contractor should not place all of his employees or people work in the premises or

associated with the construction work at a risk due to moral obligation; and contractors could have encountered cost-effectiveness as less expenses of dealing with construction accidents.

Several studies have revealed that most accidents associated with construction undertakings were attributed to a lack of proactive and preventive measures such as workforce training, risk source identification and control, safety awareness and education, inspection and so on (Park and Kim, 2013; Vasconcelos and Junior, 2015; Arif et al., 2021). On the other hand, how effective these measures could work is subject to how much job-site knowledge could be solicited and how efficiently the knowledge could be absorbed (Sacks et al., 2013; Nielsen et al., 2021). It is still considered insufficient towards different countries as the effects of social culture and organisational culture are different (Çalış and Büyükakinci, 2019). In particular, the construction industry is one of the hazardous sectors due to the dangerous nature of its characteristics such as unique of construction work and temporary nature (Fang and Wu, 2013; Williams, 2017); relies heavily on migrant workforce (Ismail et al., 2018) with the challenges in terms of language barriers (Jaselskis et al., 2008; Oswald et al., 2019) and different safety cultures on construction sites. The complex work environment (Fang and Wu, 2013) and the characteristics of worker behaviours are not as identical as other industries. The safety and health conditions in emerging and developing economics could worsen if appropriate action is not taken. Undeniably, the construction accidents bring a series of negative impacts toward the construction project performance such as delay in project completion and further increase the project cost to the construction company (Manzoor et al., 2021). As the construction industry remains as one of the key sectors contributing to the development of the country, safety and health issues must not be neglected.

The study explores the similarities and differences focused on the construction safety and health management between developed and developing countries. This is a broad study; therefore, this study is divided into two parts to better present the extent of similarities and differences between Japan and Malaysian in terms of construction safety and health management over the past decades. Firstly, the study discovers the thematic settings of a comparison of safety and health management in the construction industry between Japan and Malaysia. Secondly, the study explores a preliminary study on the effectiveness of safety training methods towards construction workers and novices in the building construction industry. The following flowchart represents the entire study.

The implementation of safety and health regulations enforced in the construction industry was reviewed to develop a better understanding of the safety management system in both nations. The relevant regulations were further discussed to examine the existing guidelines and standards on the construction accident prevention measures. The data extracted from the Department of Occupational Safety and Health (DOSH), Malaysian Social Security Organisation (SOCSO), Institute of Labour Market Information and Analysis (ILMIA), Department of Statistics (DoS) Malaysia and Japan Industrial Safety and Health Association (JISHA) from Industrial Safety Site of Ministry of Health, Labour, and Welfare (MHLW), Safety Division, Industrial Safety and Health Department, Labour Standards Bureau, Japan and other relevant information. The data were analysed by content analysis method and frequency distribution analysis.

The rationale of the data used in this study were obtained from the above related authorities in Japan and Malaysia through the official announcement platforms.

Aim of the study: To explore the key differences of construction site safety practices and safety training between Japan and Malaysia in order to obtain the usefulness practices in Japanese construction sites that can be implemented in Malaysian scenarios.

The research objectives:

Objective 1: To identify the history and current status of construction occupational safety and health management in Japan and Malaysia

Objective 2: To investigate the construction accident characteristics in Japan and Malaysia

Objective 3: To determine the factors contributed to the construction accidents in Malaysia

Objective 4: To categorise the challenges related to the occupational safety and health practices in Malaysian construction industry

Rationale: to obtain the insights and challenges related to construction workforce, government policies and contractor practices faced by the Malaysian construction industry

Objective 5: To compare the construction site safety management practices focus on foreign workers in Japan and Malaysia via the perspectives of government agencies and construction site personnel

Objective 6: To investigate the effectiveness of non-verbalized safety training methods towards Japanese and Malaysian construction novices and foreign workers from different nations in construction industry

Rationale: To obtain the usefulness of the current construction safety and health practices and safety training in the Japanese construction industry.

1.1 Safety and Health Management System in Malaysian and Japanese Construction Industry: History and Current Status

Construction industry is expected to remain strong and demanding where it is playing a significant role in driving the socioeconomic and sustainable development of developing and developed countries. Construction industry grows at a higher rate than the GDP growth when the aggregate economy expands, and during the period of recession the construction industry declines more rapidly and remains in recession longer than the aggregate economy (Khan et al., 2014). A broad perspective and to assess the major issues related to the implementation of construction safety in a comprehensive manner, four Southeast Asia countries such as Malaysia, Singapore, Indonesia, Thailand and Vietnam. In almost all these countries the construction industry has a considerable economic impact on the overall GDP contribution to the country. For instance, it contributed approximately 4% of Singapore's total gross domestic product; in Malaysia, the construction industry contributed 5.9% to the total GDP in 2017; in Indonesia, the construction industry contributed a share of 11.1% to the total GDP in 2018 and Thailand's construction industry growth averaged of 4.6% a year in between 2014-2018. The construction industry keeps on expanding, driven by government efforts in order to develop the country's transport infrastructure and to boost the residential construction market. On the other hand, it is one of the major industries that brings impacts to the national economy development by creating employment opportunities and keeps on generating new income sources for the citizens and foreign workers of the society especially this industry is labour intensive by providing job opportunities for skilled and unskilled people.

Although the GDP contribution from the construction industry is smaller than other industries such as agriculture, manufacturing and services; in spite of that, the importance of the construction industry cannot be neglected. Recently, the continuous expansion of services, tourism and manufacturing sectors have brought the impacts to maintain the growth momentum

of the construction industry. It is the essential growth enabler and significant industry of its extensive linkages with the other industries. Research shows that the country's economic development is greatly affected by the growth of the construction industry in Malaysia (Khan et al., 2014). The robust growth in residential and non-residential projects in various states in Malaysia were continuously supported by housing, infrastructure, commercial and industrial projects invested by public and private sectors. In 2016, the Malaysian economy grew at 4.2%, and the construction sector recorded moderate growth at 7.4% with the value of construction projects awarded increased to 229.0 billion Ringgit Malaysia; also, the number of contractors and personnel increased by 5.7 and 7.1% respectively in the same year (CIDB, 2017). The increasing trend of fatality rate in Malaysia construction industry occurred in 2012 to 2016 in line with the increase of construction activities such as infrastructure projects, high rise buildings, commercial and non-commercial projects. The rate of work-related injuries for the construction industry is approximately 5% among all the other industries; however, the rate of work-related fatalities in the construction industry is 27% across all the industries in 2007-2019.

According to the International Labour Organisation (ILO), most work-related deaths and non-fatal occupational accidents occur in low and middle-income countries in South-East Asia. Fatalities are the most serious safety failures in the construction industry and analysing these failures and learning from them has proved to be an effective and helpful way to diagnose current safety drawbacks (Dong and Jason, 2014). Researchers in different studies have revealed that the fatality rate in the construction industry is extremely high (Camino López et al., 2008; Pinto et al., 2011; Zhou et al., 2015). The proportions of accidents on construction sites in developing countries are relatively high (Gangoellis et al., 2010). Despite the existence of OSH laws, accident frequency in construction still remains at high level. According to the Department of Occupational Safety and Health updated record in 2018, Malaysia's construction industry with the highest rate of fatality between 2010 and 2018 is considered as one of the most dangerous industries in recent years.

Overview of Safety and Health Management System

According to the ILO (2001) guidelines of occupational safety and health management system, the safety and health committee is a committee with representation of workers' safety and health representatives and employers' representatives established and functioning at

organisation. The overview on the International Labour Organisation (ILO) attaches great importance on managing safety and health where it is part of managing a business. Therefore, ILO produces guidelines on occupational safety and health to provide fundamental instruments for governments, employers and workers to establish a safe and healthy working environment. To be particular, the guidelines of occupational safety and health management systems (ILO-OSH 2001) designed as practical instruments for assisting organisations and competent institutions as means of achieving continual improvement in OSH performance. The guidelines intended for use by all those who have responsibility for OSH management at two levels namely national and organisational (Figure 1.1).

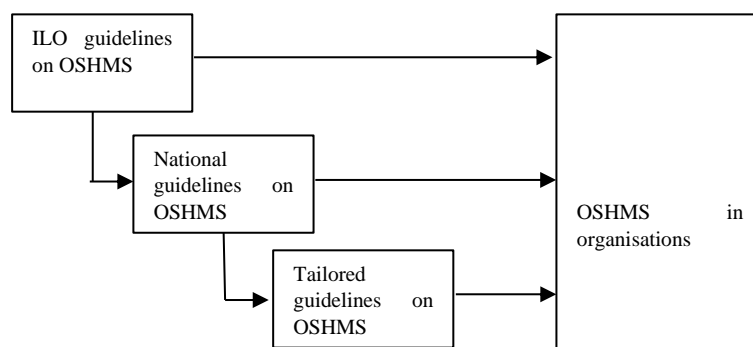


Figure 1.1: ILO framework

(Sources: International Labour Organisation OSH Management Guidelines, 2001, pg.15)

To be particular, this system consists of the main elements of Policy (consists of OSH policy and worker participation); Organizing (consists of responsibility and accountability, competency and training, OSH documentation, and communication); Planning and implementation (consists of initial review, system planning, development and implementation, OSH objectives and hazard prevention); Evaluation (consists of performance monitoring and measurement, investigation, audit and management review) and Action for improvement (consists of preventive and corrective action and continual improvement) (Figure 1.2). The system is a cyclical process of continuous improvement, so that each element, once implemented, can be tested, processes being reviewed regularly and changes adapted to and efficiencies improved from time to time as necessary.

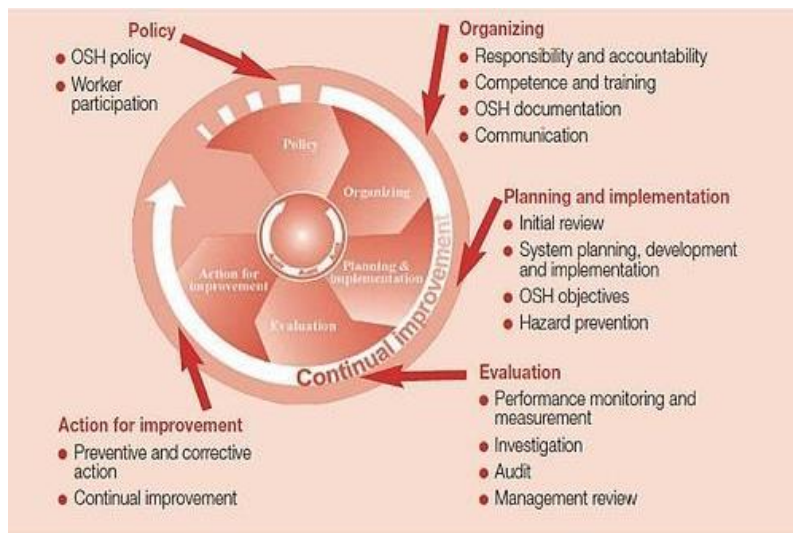


Figure 1.2: Main elements of OSH management system
(Sources: International Labour Organisation (ILO), 2001b)

According to the Labour standards of Safety and Health in Construction Recommendation 1988 (ILO, 1988), the term of employer defines as any physical or legal person who employs one or more workers on a construction site; and as the context requires, the principal contractors, the contractors or the subcontractors. At the organisation level, the employer is a legal person that allows one or more workers in his/her organisation (ILO-OSH, 2001). Therefore, the employer owns a general duty to provide a safety and health workplace environment to ensure the safety and health of his/ her worker to work safely in the workplace and to comply with the safety and health measures. It is the responsibility and duty of the employer to ensure occupational safety and health, including compliance with the occupational safety and health requirements under national laws and regulations (ILO, 2001). In simple terms, the employer should demonstrate commitment and a strong leadership of the organisation's OSH activities, implement the OSH system effectively and make appropriate arrangements for the establishment of an OSH management system.

The International Labour Organisation (ILO) describes the Safety and Health Management System as a set of interrelated and interacting elements to establish occupational safety and health (OSH) policy and objectives, and to achieve those objectives (ILO, 2001, p19). The existing Occupational Safety and Health (OSH) management system in the workplace aims to assist organisations to comply with national rules, standards and regulation to reduce accidents and improve productivity, safety and health of employees. Safety and health management is part of the organisation's management that cover the entire occupational safety and health

policy and commitment related to workplace safety and health including the accidents and illness prevention, responsibilities of management and the practices, procedures for implementation the policy to protect the workers from work-related sickness, diseases, injury and reduce the hazards and risks in all industries (International Labour Office, 2001; Health and Safety Authority, 2021).

In other words, the implementation of a safety and health management system is an important factor in ensuring that this system is managed systematically within the organisation or company (Lingard and Rowlinson, 2005). The Occupational Safety and Health Administration (OSHA) United States describes an establishment of a safety and health management program as one of the most effective approaches to protect workers at the workplace (OSHA, 2022). The Health and Safety Executive mentions a health and safety to be a formal system or framework that helps to manage safety and health (HSE, 2013). Safety management provides a systematic approach to identify hazards and control risks while ensuring these risk controls are effective (Construction Placements, 2021).

An investigation on the extent of implementation of safety and health management practices by contractors in several South East Asian countries was carried out by a group of researchers in 2016 and found out that there are at least seven practices under policy element of safety and health management, risk assessment, organising, implementing element that are uncommon implemented by the contractors in Malaysia, Vietnam and Cambodia (Manu et al., 2018). In Malaysia, there are still many contractors who do not have designated safety and health budgets for their company and or projects (Manu et al., 2018) (Table 1.1). Researchers investigated the level of implementation of safety and health practices among the construction personnel and released that there were several practices that were under the stage of low implementation. The following summary was focused on Malaysian context based on the findings by Manu et al. (2018).

Table 1.1: Low implementation of safety and health management practices

Safety and health management practices under	Low implementation of
Policy	a company director with overall responsibility for safety and health;
Planning	preparing safety and health plans for every construction project; pricing to cover safety and health requirements for projects; preparing method statements and setting safety and health performance targets;
Risk Assessment	undertaking risk assessment for work; reviewing and updating risk assessments during construction and informing employees about hazards on sites before work starts
Organizing	communicating safety and health information to workers through newsletters,

	leaflets, posters, etc.; networking with other companies and institutions about safety and health issues; propagating safety and health practices to external stakeholders; a designated safety and health department; assessing the competence of workers and subcontractors; open display of company safety and health policy on construction sites company website and head/branch offices; provision of safety and health annual reports; a designated safety and health manager;
Implementation	amending and correcting safety and health plans during construction; rewarding workers for safe work behaviour; carrying out site safety and health inspection regularly; provision of sanitation and welfare facilities on sites; disciplining workers for unsafe work behaviour;
Measuring and reviewing performance	measuring safety and health performance; reviewing and updating safety and health plans after projects completion; keeping incident records on every project; investigating the causes of incidents, accidents and near-misses;
Auditing	Undertaking periodic safety management auditing

(Source: (Manu et al., 2018))

History and Current Status of Occupational Safety and Health (OSH) Legislation in Japan and Malaysia

The OSH existed more than 110 years ago, in the late 19th century. The development of OSH legislation was started with the introduction of factories and boilers that dominate as power source back to the 1910s; and then followed by the industrial safety, industrial safety and health, and lastly occupational safety and health that covers almost all areas of work in Japan and Malaysia. With the change of time and economic development, the Japanese and Malaysian governments have started to pay attention to safety and health related issues in major economic activities and have promulgated various safety and health related laws, regulations, standards guidelines, and code of practice to manage the industries. This chapter will be focusing on the Japanese and Malaysian construction industry with the relevant laws and regulations.

Historically, the focus on accident prevention in both nations has been relatively centred on the 1970s, when Asian countries experienced strong economic growth in the early 1970s. Japan Construction Occupational Safety and Health Association (JCOSHA) was established based on the law regarding the Industrial Accident Prevention Organisation to promote voluntary occupational safety and health activities in the industry in 1964; and Japan Industrial Safety and Health law (JISHA 1972) was promulgated in conjunction with the Labour Standards Act. In Malaysia, the OSH history can be described in six eras started with Steam Boiler Safety Era before 1914, Machinery Safety Era in 1914-1952, Industrial Safety Era in 1953-1967,

Industrial Safety and Hygiene in 1970-1994, Occupational Safety and Health Era after 1994 and the following years were introduced with Occupational Safety and Health Master Plan ear. The construction safety related legislations in Malaysia were covered in the OSHA 1994. Table 1.2 and Table 1.3 indicated the summary of OSH history in both countries.

Table 1.2: Summary of OSH history in Japan

Year	Outline of OSH history in Japan
1911-	The Factories Act was announced and enforced in 1916
1916	The “green Cross Motif” was adopted as a symbol mark of safety
1927	The National Safety Week was initiated
1928	
1929	Ordinance on the Factory Accident Prevention and Health (Hygiene) was promulgated
1932	National Industrial Safety Convention was initiated
1935	Ordinance on Boiler Control was promulgated
1936	Ordinance on Safety and Health for Civil Engineering and Construction Work Sites was promulgated
1942	The Research Institute of Industrial Safety (RIIS) was established by the Ministry of Welfare
1947	Labour Standard Law was promulgated; The Ministry of Labour was established. Ordinance on the Occupational Safety and Health etc. was put in force
1950	National Occupational Health Week was initiated as an independent activity
1952	No Accident Record Movement was initiated
1953	Nationwide Safety Organisation (Predecessor of the JISHA) was founded. The National Occupational Health Convention was initiated.
1956	The Research Institute for Occupational Health was established. (The Institute was reorganised in 1976 as “National Institute of Industrial Health (NIIH)”)
1958	Industrial-Accident Prevention Five-Year Plan was formulated.
1959	Ordinance on Safety of Boilers and Pressure Vessels was promulgated. Ordinance on Prevention of Ionizing Radiation Hazards was promulgated
1960	The Pneumoconiosis Law was promulgated. July of every year was designated as “People's Safety Day”. Ordinance on Prevention of Organic Solvent Poisoning was promulgated
1961	Ordinance on Safety and Health at Work under High Pressure was promulgated
1962	Ordinance on Safety of Cranes and Other Similar Equipment was promulgated
1964	Industrial Accident Prevention Organisations Law was promulgated. Established the Japan Industrial Safety and Health Association (JISHA) based on the Industrial Accident Prevention Organisation Act. The Japan Safety and Health Association by the industrial sector was established.
	Established of Japan Construction Occupational Safety and Health Association (JCOSHA)
1969	Ordinance on Safety of Gondola was promulgated
1971	Ordinance on Prevention of Hazards due to Specified Chemical Substances was promulgated. An Ordinance on Health Standards in the Office was promulgated. Ordinance on Prevention of Anoxia, etc. was promulgated
1972	Japan Industrial Safety and Health Law was promulgated. Ordinance on Industrial Safety and Health, etc. was promulgated.
1973	The Zero-Accident Total Participation Campaign was initiated. Ordinance on Industrial Safety Consultants and Industrial Health Consultants was promulgated. The Tokyo Safety and Health Education Centre was established.
1975	Working Environment Measurement Law was promulgated
1977	The subsidy program for small and medium sized enterprises health management was initiated.
1978	The University of Occupational and Environmental Health was established. The Osaka Safety and Health Education Centre was established.
1979	Ordinance on prevention of Hazards due to Dust was promulgated
1981	The subsidy program for working environment management at small and medium-sized enterprises was initiated
1982	“Safety Work Cycle Activity” in the construction industry was proposed. Japan Bioassay Research Centre was founded
1983	Ordinance on Industrial Safety and Health was partially revised (safety measures for industrial robots)
1984	Construction Industry Safety and Health Training Centre was founded.
1992	The Industrial Safety and Health Law was partially revised (for creating a comfortable working environment)
1995	Changed of RIIS to National Institute of Industrial Safety (NIIS)
1996	The guidelines for the scaffolding advance construction method were formulated
1999	The Japan International Centre for Occupational Safety and Health (JICOSH) was founded
2000	Japan Advanced Information Centre of Safety and Health (JAISH) was founded
2005	Ordinance on Prevention of Health Impairment due to Asbestos was promulgated
2006	The Research Institute of Industrial Safety (RIIS) and National Institute of Industrial Health (NIIH) were integrated into the National Institute of Occupational Safety and Health, Japan (JNIOOSH). The guidelines for the scaffolding advance construction method were revised
2007	Ratification of the Convention on Frameworks for Promoting Occupational Safety and Health (ILO No. 187) The Japan International Centre for Occupational Safety and Health (JICOSH) was closed
2008	Industrial safety campaign century project has started nationwide since October 2010 to commemorate the year 2011 as the
2010	100th after an imported idea of safety-first was put into practice for the first time in a company in Japan
2014	The Industrial Safety and Health Act was revised (for stress check, chemical risk assessment, etc.) Guidelines on Prevention of Radiation Hazards for Workers Engaged in Nuclear Accident-derived Waste Management and Guidelines on Prevention of Radiation Hazards for Workers Engaged in Decontamination and Related Works were published
2016	National Institute of Occupational Safety and Health Japan and Japan Bioassay Research Centre were transferred to Japan Organisation of Health and Safety

2018	Promulgation of related laws of work-style reform (including revisions to the Labour Standards Law, Industrial Safety and Health Law, etc.)
2019	The Industrial Safety and Health Act Enforcement Ordinance (Safety Law) and the Industrial Safety and Health Regulations (Safety Regulations) were revised

Sources: JISHA. Available online at <https://www.jisha.or.jp/english/information/history.html> (Access May 2023)

The current use of self-regulation through the enactment of the Occupational Safety and Health Act (OSHA) in 1994 was considered as comprehensive and it was practised to enhance the safety and health culture; yet, the level of awareness and practicability of it is considered as low in Malaysia construction industry. The current status of health and safety management in the construction industry is being questioned as the construction accidents rate is increasing. In contrast, Japan's safety and health involvement is far more comprehensive than in Malaysia, in terms of ordinance, guidelines, education, training centre, major and minor safety and health related activities, government resources such as subsidies, and historical updates.

Table 1.3: Summary of OSH history in Malaysia

Year	Outline of OSH history in Malaysia
1844	British specified safety and health legislation such as transportation of machinery on the train
1892	The first steam boiler law of Malaysia, Selangor Boiler Enactment was legislated
1903	Steam Boiler Law was enforced in Perak, Malaysia
1908	The steam boiler legislation enforced by inspectors of boilers became uniform among four states (Perak, Selangor, Pahang and Negeri Sembilan)
1914	Machinery Enactment of 1913 was enforced and replaced the steam boiler enactments
1932	Machinery Enactment of 1932 replaced the Machinery Enactment 1913, Registration and inspection of installation were enforced.
1952	Machinery Department was established to address machine safety, remained a branch of the Mines Department until 1952
1953	Machinery Ordinance 1953 was enforced, applied to the Federation of Malaya. (Weakness: workers were not protected if they are working in a workplace that does not use machinery) (DOSH, 2010)
1967	The Factory and Machinery Act (FMA) was approved by the Parliament. The Department of FMA has been established. To protect workers working in factories and working with machineries. Covers OSH in manufacturing, mining, quarrying and construction industries, other industries were not covered. (Consists only 24% of the nation's total manpower)
1969	Reorganisation of the department of FMA to adapt the country's speedy economic development and the enforcement of laws related to the department.
1970	The Factory and Machinery Act and eight regulations under the Act were enforced in Peninsular Malaysia and replaced the Machinery Ordinance 1953.
1971	The formation of the Anti-Pollution Section and formation of Industrial Hygiene Unit (upgrade of its status to Industrial Hygiene Section in 1980)
1980	The Factory and Machinery Act was further enforced in Sabah and Sarawak.
1984	The Petroleum Act (Safety Measures) was enforced.
1985	The formation of Petroleum Safety Section, the Regulations (Safety Measures) (Transportation of Petroleum by Pipelines)
1987	Special inspection activities to prevent major industrial accidents, industrial safety and health activity exercises with experts from the International Labour Organisation.
1988	The formation of Construction Industry Standard (CIS)
1991	The establishment of National Institute of Occupational Safety and Health (NIOSH) Malaysia, officiated by the Ministry of Human Resource in December 1992.
1993	A national workshop on occupational safety and health information strategy development was organised by Factory and Machinery Department, Asia-OSH and International Labour Organisation (ILO)
1994	Occupational Safety and Health Act (OSHA) 1994 was approved and gazetted. (Refers to the British OSH Act 1970, that includes a general duty for employers). Cover 90% of the nation's total manpower at work except on board ships and the armed forces. The Department of Factory and Machinery has been renamed as the Department of Occupational Safety and Health (DOSH). Malaysian Construction Industry Development Board Act 1994 (Act 520) was approved.
1995	Establishment of National Council of Occupational Safety and Health (NCOSH) by Ministry of Human Resource Establishment of Construction Industry Development Board (CIDB) by the Ministry of Works
2009	Occupational Safety and Health Master Plan 2015 (Safety and Healthy Work Culture) was launched.
2016	Occupational Safety and Health Master Plan 2016-2020 (Preventive Culture at the workplace) was launched.
-	
2020	

Source: DOSH (2023). Available online at <https://www.dosh.gov.my/index.php/about-us/dosh-profile> (assessed by June 2023)

JISHA 1972 in Japan and OSHA 1994 in Malaysia

In addition, an in-depth look at the Safety and Health Acts implemented in Japan and Malaysia to further determine the differences of acts towards the OSH issues between both nations. The establishment of OSHA 1994 enforced by the Department of Occupational Safety and Health (DOSH) Malaysia is based on the self-regulation approach, supported by code of practices, guidelines and encourages workers cooperation and participation to adapt the construction industry to establish effective safety and health performance in the workplace. The DOSH is under the Ministry of Human Resources Malaysia, it is responsible for ensuring the safety, health and welfare of people at work and protecting other people from the safety and health hazards arising from the economic activities (DOSH, 2023). The employers are obligated to formulate OSH policy, to provide maintenance of plant and systems of work, information, instruction, training, and supervision to ensure the employees' safety and health, while employees have to comply with the instruction or measures on OSH instituted by employer, to wear or use protective equipment provided by the employer, to take reasonable care for the safety and health of themselves and of other persons who may be affected by their acts or omission at work stipulated under Part IV and Part VI of OSHA 1994.

In Japan, the JISHA 1972 has been improved and revised regularly in order to respond to changes in the industry, enhance the impact on the safety measures of the construction industry. Studies showed that forced pressure is able to reduce the occurrence of construction accidents among workers during the construction works (Tagod et al., 2021). Table 1.4 shows the contents of the Acts implemented in both countries.

Table 1.4: OSHA 1994 in Malaysia and JISHA 1972 in Japan

Occupational Safety and Health Act 1994		Japanese Industrial Safety and Health Act 1972	
Part	Description	Chapter	Description
I	Preliminary	I	General Provisions
II	Appointment of Officers	II	Industrial Accident Prevention Plan
III	National Council for Occupational Safety and Health	III	Organisation for Safety and Health Management
IV	General Duties of Employers and Self-employed Persons	IV	Measures for Preventing the Dangers or Health Impairment of Workers
V	General Duties of Designers, Manufacturers and Suppliers	V	Regulations concerning Machines, etc. and Harmful Substances
VI	General Duties of Employees	VI	Measures in Placing Workers
VII	Safety and Health Organisations	VII	Measures for Maintaining and Promoting Workers' Health
VII	Notification of Accidents, Dangerous Occurrence, Occupational Poisoning and Occupational Diseases, and Inquiry	VII-2	Measures for Creating a Comfortable Work Environment
IX	Prohibition Against Use of Plant or Substance	VIII	Licence, etc.
X	Industry Codes of Practice	IX	Safety and Health Improvement Plan, etc.
XI	Enforcement and Investigation	X	Inspection, etc.
XII	Liability for Offences	XI	Miscellaneous Provisions
XII	Appeals	XII	Penal Provisions
I			
XI	Regulations		
V			
XV	Miscellaneous		

The current OSHA 1994 Law Amendment, Substitution and New Added

The existing Occupational Safety and Health Act 1994 (OSHA 1994) has been amended and the Factories and Machinery Act 1967 (FMA 1967) is to be repealed in 2022 and are pending an enforcement date to be decided by the human resources minister. The amendment of OSHA 1994 includes the introduction of 27 new sections, removal of 2 sections and the amendment of 35 existing sections. This action seeks to integrate the OSHA and FMA provisions into comprehensive safety and health legislation to be applied to all places of work in Malaysia such as manufacturing, construction, hotels, restaurants and retails except for work with the armed forces, work onboard ships and work in private homes as domestic helpers. The amended OSHA 1994 allows employees to proactively safeguard their safety and health, for instance, the employees are empowered to voice up about the safety and health issues at workplace. In this regard, the employers' duties are extended to contractors, sub-contractors and the employees of such contractors and sub-contractors engaged by and working under the direction of the employer. The safety measures such as implementing emergency procedures, provide training and sufficient resources to ensure safety and health obligations are met. Besides, more regulations on machinery have been included in the amended OSHA. In particular, the requirement of a certificate of fitness before the installation and operation of any plant; such activities must be carried out by a competent person under the act for the selected

machinery. The FMA 1967 is specific on the types of machinery it does and does not regulate, and also contains provisions on safety, health and welfare related to employees, yet it is not as comprehensive as the OSHA 1994. The amended OSHA does not appear to fill the void in all industries, and this might be rectified in the future with more prescribed regulations from the minister after a period of observation and practice.

Historically, the occupational safety and health related act was promulgated in 1972 in Japan and 1994 in Malaysia with a difference of 20 years. There is a lack of comprehensive analysis of the similarities and differences in construction safety and health issues between developing and developed countries. It is worth comparing the current state of construction occupational safety and health between Japan and Malaysia. Particularly, Malaysia is still positioned as a developing country and is expected to develop its construction market in the future. Therefore, this study aims to examine the disparity issues in the construction industry between Japan and Malaysia. Japan was chosen due to its remarkable improvement on the safety and health performance and the comprehensive safety and health regulatory framework.

Current Status of Safety Management in the Construction Industry

The Occupational Safety and Health Management System (OSHMS) is an integrated approach on how to manage safety and health in the workplace while at the same time ensuring continuous system improvement. Occupational safety and health management systems (OSHMS) approach gain support from ISO standards and it is known as one of the vital mechanisms to tackle the OSH performance in various industries. It is a stepwise and logical method to monitor the progress toward the goals, identify areas for improvement and be able to adapt to the changes in the organisation and to legislative requirements (International Labour Organisation, 2011). OSHMS is a set of elements that are interrelated or interact with each other to establish and implement occupational safety and health policy and its objectives, to achieve those objectives to manage risk in the workplace. The use of the systems in the workplace whether in the form of accredited or non-accredited form has been proven to minimise the risk to safety and health hazards in the workplace; it is voluntary for any organisation, except to the extent that it is mandated by the authorities or regulation through local regulations, by-laws or any other similar means (UPM, 2023).

Plan-Do-Check-Act Cycle

The concept of OSHMS is based on a continuous quality improvement model, the principle of the “Plan-Do-Check-Act” (PDCA) cycle developed by Dr. Walter A. Shewhart in the 1920s (International Labour Organisation, 2011). With the concept of PDCA applied into the OSH, the “Plan” refers to the OSH policy including the allocation of resources and risk assessment; while “Do” step indicates the actual implementation of the OSH programme, whereas the “Check” is dedicated to measure the active and reactive performance of the programme and the “Act” indicated the last step of the cycle in the system with the context of continual improvement of the programme. The OHSMS consists of the main elements of policy, organising, planning and implementation, evaluation, and action for improvement. Safety and health policy and plan are found to be the most important practices in terms of productivity in building construction projects (Gurmu, 2019).

Based on the explanation of Australian scientist, Bottomley, the definition of occupational safety and health management system is the connection and arrangement of the processes on a continuous fashion in order to achieve specific objectives and to render occupational safety and health management repeatable and identifiable (cited by Çalış and Büyükakinci, 2019). Bottomley also emphasises that corrective actions are the basis of a systematic approach. ILO stated that OSHMS aims to provide a method to measure and improve safety and health performance in prevention of incidents with the effective management of hazards in the workplace. Generally, occupational safety and health management systems are a tool that allows the maintenance of the harmonisation between occupational safety and health activities and the strategies of the enterprises and that can be used in the improvement and resolution of the activities on a permanent basis in both organisation and the world. Occupational safety and health management systems ensure the activities to be simple, easy and understandable to implement in the workplace while establishing an effective prevention system regardless of level difference in the operation system to improve the countries’ development levels (Çalış and Büyükakinci, 2019). An effective OHSMS is required to contain identification of all safety hazards at construction sites (Jaafar et al., 2017), contain the risk management procedures to keep risk from hazards down to acceptable levels, to monitor with regular evaluation of safety performance continuously and improve the effectiveness of the safety management system continuously. However, there are always pitfalls which if not avoided can lead the exercise toward failure in developing countries. A number of issues such as lack of resources in terms

of skilled labour, technology and socio-economic conditions which will put pressure on the effective management of safety and health (Manu et al., 2019). There are several limitations found from OSHMS stated by ILO such as excessive paperwork and inequalities between management processes and workers. Figure 1.3 and Figure 1.4 showed the overview of OSHMS in both countries.

Current Status of Safety Management in the Malaysian and Japanese Construction Industry

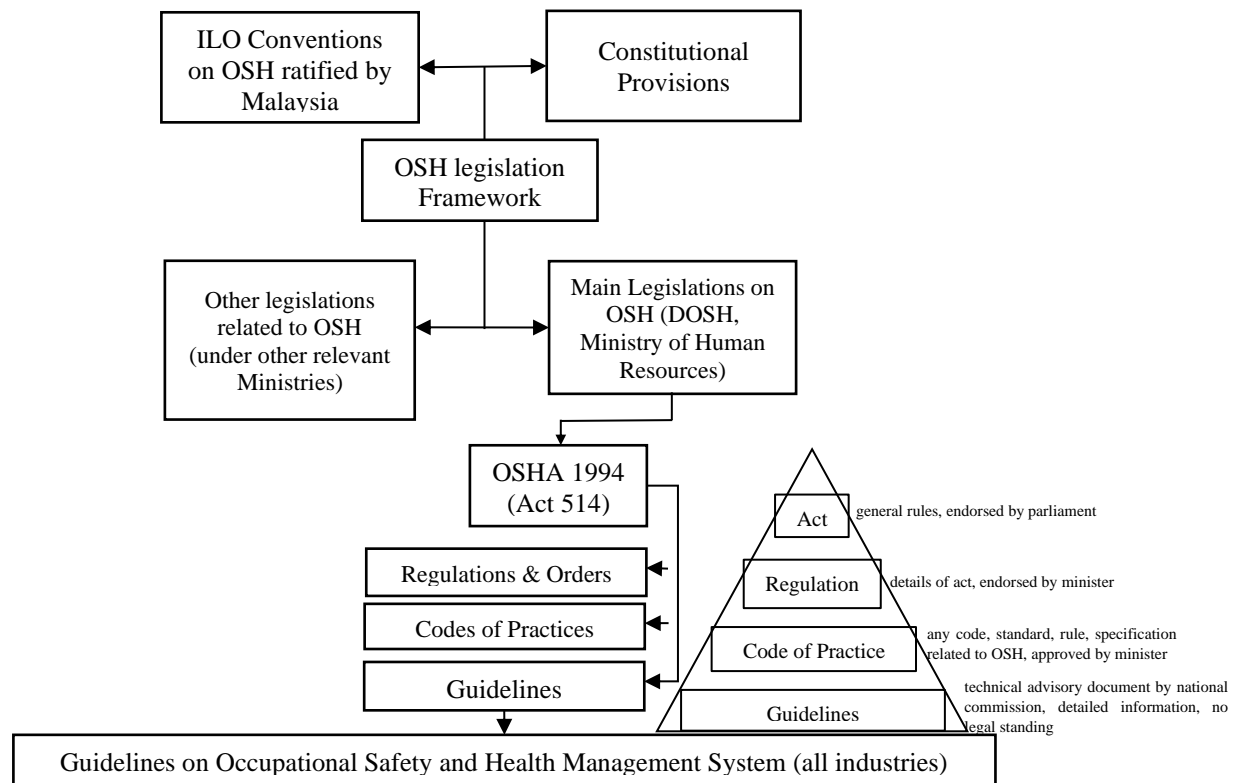
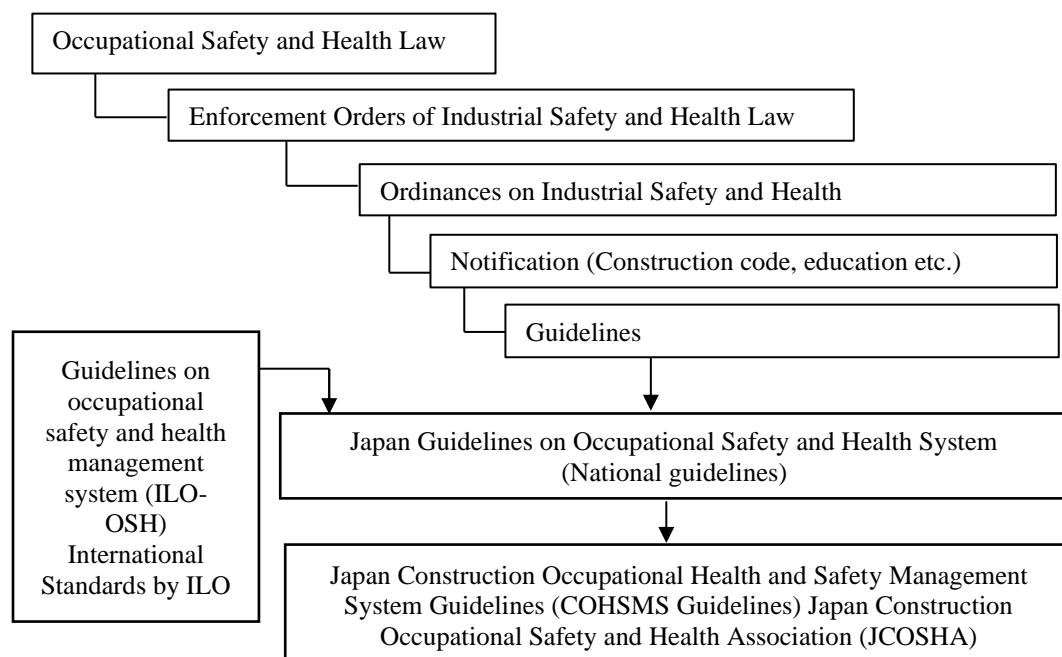


Figure 1.3: Safety and Health Management System in Malaysia



(COSHA's OHSMS guidelines fall under the guidelines for business categories recommended by the ILO)

Figure 1.4: Safety and Health Management System in Japan (Source: JCOSHA, 2023)

The COHSMS system is a framework for a range of continuous voluntary safety and health management activities with the involvement from principal contractors, employers, sub-contractors and their organisations. The system complies with the “Plan-Do-Check-Act” processes to the aims to enhance the occupational safety and health standards in construction sites. On this basis, the necessary measures are systematically and continuously to be carried out by the employees, principal contractors, and sub-contractors in the construction sites for construction projects including construction supervision.

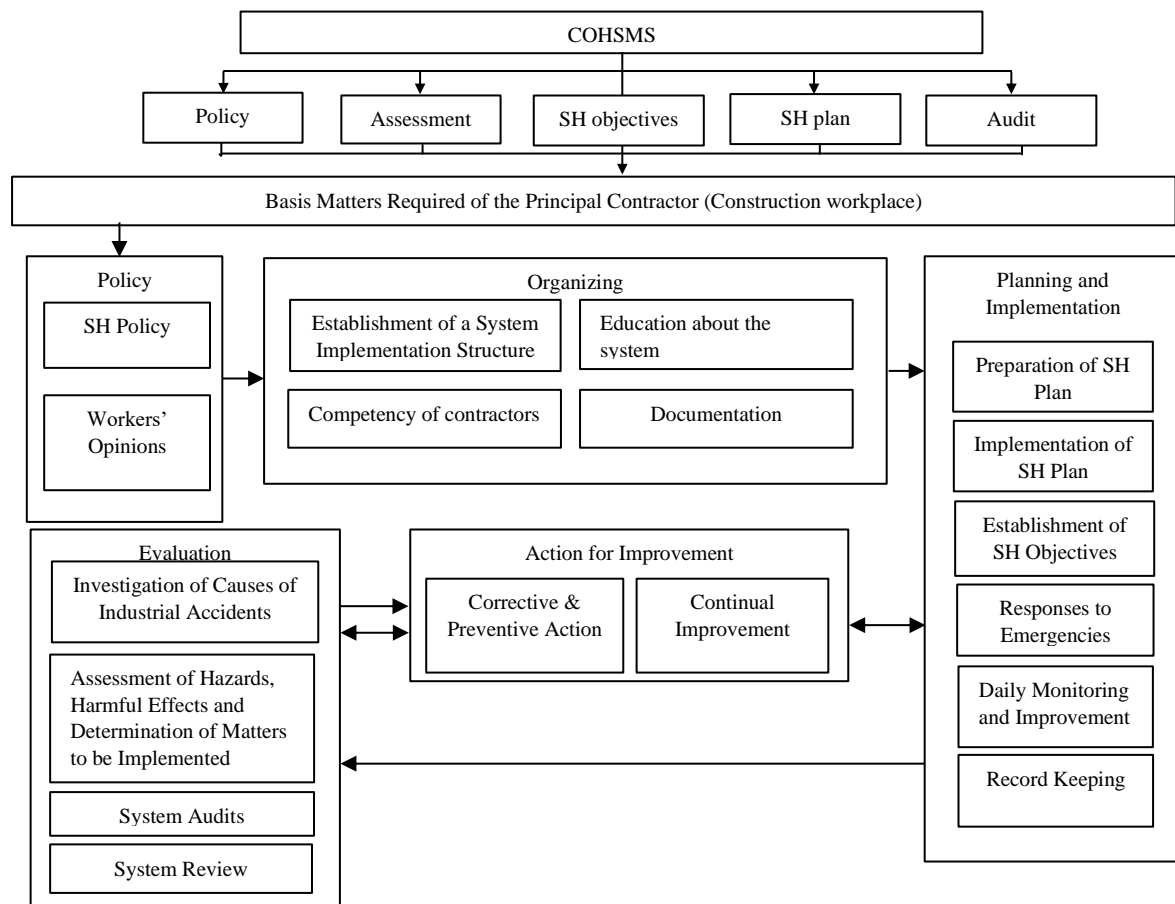
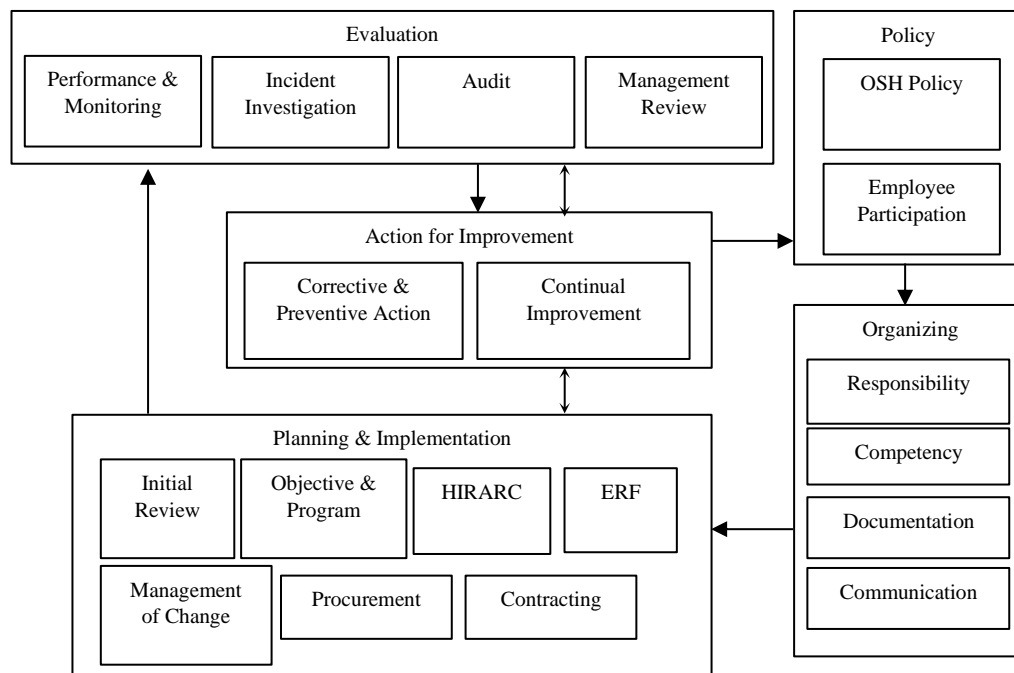


Figure 1.5: COHSMS in Japanese construction industry (*modified by the author*)

The continual improvement cycle of OSHMS was further developed with the ILO guidelines shown in Figure 1.5. In Malaysia, the elements of Occupational Safety and Health Management System (OSHMS) consist of evaluation, action for improvement, OSH policy, organising, planning and implementation as main elements, whereas all the main elements solicit sub-elements shown in Figure 1.5 and Figure 1.6 in both countries.



**The main arrow indicates the interaction between each main element of OSHMS, the double headed arrow indicates the systemic interaction between the sub elements respectively.*

**ERF indicate Ergonomic Risk Factors*

**HIRARC indicate Hazardous Identification, Risk Assessment and Risk Control*

Figure 1.6: Implementation OHSMS Framework in Malaysia

(Source: Guidelines on Occupational Safety and Health Management Systems, Department of Occupational Safety and Health Ministry of Human Resources, Malaysia, 2011)

According to the International Labour Organisation (ILO), there are more than 229 million construction workers worldwide, which has doubled in ten years since 2013. The construction industry does not have the ability to trial and error before building, especially as it requires a variety of machinery, capital and intensive manpower. It is fairly different from other industries due to the unique characteristics. Construction industry is regarded as a dirty, dangerous, difficult and demanding industry; and yet, it has become renowned as one of the important industries throughout the globe. It was one of the major contributors for a country's growth in domestic product (GDP). Most importantly, the construction industry produces all the facilities needed for the production of goods and services, starting from those needed by other producers and ending with those needed by the ultimate consumers (Crosthwaite, 2000). Hence, it is fundamentally crucial to make construction projects completed successfully within time, budget and desired quality.

The construction industry, while ‘instrumental in influencing human health, economic activities and social behaviour as well as cultural identity and civic pride construction industry is regards as a dangerous industry, while plays an important role to satisfy human development needs (Al Haadir and Panuwatwanich, 2011; Azuin et al., 2013). Despite improvements over the decades, accidents and injuries continue to plague the construction industry. Nowadays, it is common to hear of tragic accidents or incidents in the construction industry that result in injury, death or illness to workers and the public. Especially in developing and emerging countries, the health and safety situation could get worse if appropriate and effective actions are not taken. Health and safety are multi-pronged and widely acknowledged that the management of health and safety act as the key role to drive improvement and to reduce the accidents, injuries and illness in the construction industry (Aksorn and Hadikusumo, 2008). However, in emerging and developing countries, there is limited research evidence about the extent of implementation of health and safety management by contractors (Manu et al., 2018).

Occupational Safety and Health Master Plan in Malaysia

The Occupational Safety and Health (OSH) in Malaysia was planned as a series of three consecutive 5-year action plans in Malaysia OSH Master Plan (2005-2020). There are three phases in order to achieve a sustainable safety culture in all industries in Malaysia. The Occupational Safety and Health Master Plan (OSHMP) 2015 was launched by the Prime Minister of Malaysia in May 2009 which is at the middle stage to develop a safe, healthy and productive human capital by adopting, promoting and maintaining a safe and healthy work culture at the workplace. Table 1.5 indicated the strategies of OSH master plan in Malaysia.

Table 1.5: OSH Master Plan in Malaysia

Phase	Outcome(s)	Strategies (ST)
2005-2010	OSH Ownership	ST 1: to foster and enhance government leadership and practices; ST 2: Preventive workplace safety cultures; ST 3: Industry leadership and community engagement ST 4: Develop strong partnerships locally and internationally
2010-2015	Self-Regulation	
2015-2020	Prevention Culture	
2021-2025	Inclusive OSH – Togetherness and commitment	ST 1: Empowering OSH in the public sector; ST 2: Reinforcing self-regulation practices in the workplace; ST 3: Promoting OSH education and research; ST 4: Empowering Occupational Health; ST 5: Increase in OSH compliance in SME sector; ST 6: Enhancement of OSH through technology; ST 7: Strengthening OSH in work-related road safety, informal sectors, and future jobs.

Industrial Accident Prevention Plan in Japan

According to the 13th Industrial Accident Prevention Plan in Japan, the changes in fatal accidents by accident types in the construction industry in the five-year program indicated the fatal accidents and casualties had decreased on average on each program since the 9th program in 2000. For instance, the construction accident rate was recorded 6.27 in 2000 and reduced to 4.48 in 2020; however, the construction fatalities recorded 34% or 8,964 out of 26,104 total fatality cases caused construction workers died at construction sites between 2000-2020 in Japan (JISHA, 2020).

1.1.1 Comparison of the Guidelines related to Occupational Safety and Health in Construction Industry in Japan and Malaysia

Generally, the main responsibility for labour safety at site is imposed on the principal contractor in developed countries such as Japan, France and U.K. (Hino et al., 2011) and Malaysia. The principal contractor is required to plan, manage, monitor and coordinate the construction work and control the risks at the workplace. However, appropriate mitigation prevention methods and workers' safety awareness are insufficient in developing countries (Biswas et al., 2017).

The Guidelines on Occupational Safety and Health Management System (ILO-OSH 2001) stated the basic concepts of safety and health that are able to guide the construction workplaces to improve safety and health standards including industrial accident prevention and activities to compliance with the related laws and regulation. Many countries have adopted and adapted the guidelines for their own national use in various economic sectors including the construction industry. For instance, the Construction Occupational Health and Safety Management System Guidelines (COHSMS) were published in 1999 and revised in 2006 in Japan; while in Malaysia, the DOSH published the “Guidelines on Occupational Safety and Health Management System” in 2011 to guide the implementation of the MS1722: Occupational Safety and Health Management Systems-Requirement standard and to support the objective of the OSH-MP15; then, the DOSH further published the Guidelines on Occupational Safety and Health in Construction Industry (Management) in 2017 to provide guidance and minimum roles of the client, contractor and designer, to continue the process of improvement.

Japan attached great importance to safety and health in the construction industry with a comprehensive safety management programme stipulated by the Construction Occupational

Health and Safety Management System (COHSMS) guidelines. The Japan COHSMS guidelines are edited and re-edited for the construction industry. The guidelines stated the health and safety policy presents the basic concepts of safety and health that able to guide the construction workplaces to improve safety and health standards such as industrial accident prevention, implementation safety and health related activities and to compliance with the Act and related laws and regulation to establish an appropriate and continuous implementation system in construction sites by the contractors. Contractors in the developed countries consider effective safety training as a company strategy for better safety outcomes (Demirkesen and Arditi, 2015). The development of a pool of trained workers in appropriate site management would lead to effectiveness on site (Ofori et al., 2013).

Both guidelines were adapted in accordance with the ILO-OSH management system 2001 to establish an appropriate and continuous implementation system in construction sites by the contractors. However, the Japan COHSMS guidelines tend to be more comprehensive than the Malaysia GOSHCIM guidelines. In view of the basic needs for principal contractors and responsibilities of contractors in the construction industry, both guidelines stated the requirements (Table 1.7). The COHSMS of Japan stated the basic needs for principal contractors in detail, however, the GOSMCIM of Malaysia only stated the minimum roles and responsibilities of the client, contractor and designers. To provide an overview on the guidelines between the international guidelines and guidelines in both nations, a comparison table shows as follows (Table 1.6).

Table 1.6: Comparison of COHSMS guidelines Japan and guidelines OSHMS Malaysia based on ILO-OSH 2001

Guideline on Occupational safety and health management system (ILO-OSH 2001)	Japan COHSMS guideline (Basic requirements for construction sites)	Guidelines on Occupational Safety and Health Management System, Malaysia (all industries) (GOSHMS)
3.1 Health and safety policy	5.2.1 Statement of construction safety and health policy	3.1.1 Occupational safety and health policy
3.2 Participation of workers	5.2.2 Reflecting the opinions of construction workers and employees of business establishments related to the construction work	3.1.2 Employee participation
3.3 Responsibility and accountability	5.2.3 Dissemination of system	3.2.1 Responsibility and accountability and authority
3.4 Ability and education / training	5.2.4 Evaluation of safety and health management ability of related contractors	3.2.2 Competence and training and awareness
3.5 Documentation for the management system	5.2.5 Documentation 5.2.6 Record	3.2.3 OSH MS documentation
3.6 Communication	5.2.10 Second item of preparation of construction safety and health plan (2)	3.2.4 Communication
3.7 Initial survey	5.2.7 Investigation of danger and harmfulness, etc. and determination of implementation items	3.3.1 Initial review

3.8 Developing and implementing of a health and safety plan	5.2.10 Developing of a health and safety plan 5.2.11 Implementing of a health and safety plan	3.3.2 Occupational safety and health objectives 3.3.3 Hazard Identification, Risk Assessment and Risk Control (HIRARC)
3.9 Health and safety goals	5.2.9 Implementation of health and safety goals	-
3.10 Removal of hazards	5.2.12 Measures for emergencies	3.3.4 Emergency Preparedness and Response 3.3.5 Management of change
3.11 Investigation and measurement of implementation status	5.2.13 Routine inspection / improvement, etc.	3.4.1 Performance monitoring and measurement
3.12 Investigation of injuries and illnesses	5.2.8 Efforts to maintain and improve physical and mental health and create a comfortable working environment	3.4.2 Incident investigation
3.13 Audit	5.2.16 System audit	3.4.3 Audit
3.14 Management review	5.2.17 System review	3.4.4 Management Review
3.15 Prevention and corrective measures	5.2.14 Investigation of causes of occupational accidents, etc.	3.5.1 Preventive and corrective action
3.16 Continuous improvement	5.2.13 Second item of daily improvement, etc. (2) 5.2.14 The second item of investigation of the cause of occupational accidents, etc. (2)	3.5.2 Continual improvement

Table 1.7: Basic needs for principal contractor (COHSMS Guidelines) and responsibilities of contractor (Guidelines of OSH in Construction Industry (Management)) 2017 Malaysia

Section	Principal Contractor (COHSMS Guidelines)	Paragraph	Principal Contractor (OSH (management) Guidelines)
5.1.1 5.1.2	Declaration of safety and health policy Incorporation of workers' opinions	92-105	Section 5.3 What should a principal contractor do? Planning, managing, monitoring, and coordinating the construction phase
5.1.3	Establishment of a system implementation structure	106	Providing suitable site inductions
5.1.4	Implementation of education about the system	108	Preventing unauthorised access to the site
5.1.5	Evaluation of safety and health management capability of related contractors	110	Providing welfare facilities
5.1.6	Documentation	112	Liaising with the principal designer
5.1.7	Record keeping	114	Consult and engage with workers including the safety and health and welfare stated in the Act
5.1.8	Assessment of hazards, harmful effects, or equivalent and determination of matter to be implemented		
5.1.9	Establishment of safety and health objectives		
5.1.10	Preparation of safety and health plan		
5.1.11	Implementation of safety and health plan		
5.1.12	Responses to emergencies		
5.1.13	Daily monitoring and improvement		
5.1.14	Investigation of causes of industrial accidents		
5.1.15	System audits		
5.1.16	System Review		

1.2 Safety Issues in the Japanese and Malaysian Construction Industry (General point of view)

Safety Issues in Malaysian Construction Industry

The Construction Industry Transformation Programme (CITP) was launched and implemented in 2015 by the CIDB to provide support for the continued growth and success of the construction industry including a wide range of programmes, initiatives and activities. The CIDB technical publication reported three (3) pertinent questions that focused on the current

safety and health issues in Malaysian construction industry; the feedback from the stakeholders were obtained from the meeting discussions. The following tables present the summary of the feedback from several groups of stakeholder's representatives who were selected by United Kingdom Health and Safety Executive (HSE) (a national regulator for workplace health and safety in the UK), DOSH and CIDB Malaysia (CIDB, 2018) towards the questions. The representatives include developers, designers, contractors, worker representation, training organisations and health and safety professionals. Table 1.8, Table 1.9 and Table 1.10 indicated the feedback from the stakeholders in Malaysia.

Question 1: Why does the Malaysian construction industry have such relatively poor health and safety performance?

Table 1.8: Feedback from the stakeholders in Malaysia

Feedback from the stakeholders towards	
Industry Structure	<ul style="list-style-type: none"> 1) Outgrown its capacities, dependent on cheap, unskilled labour, insufficient skilled workers, insufficient trained and competent supervisors, insufficient trained workplace safety officers and site safety supervisors. 2) Happy with the old ways of doing things, do not opt for improvement especially in smaller projects, contractors will not do anything until told to do so by DOSH; low-cost labour solutions are preferred. 3) Widespread view that safety provision is an optional extra 4) Sites are used as training grounds for unskilled migrant workers 5) Limited appreciation of the need for safety provision on low level development (<4 storeys) 6) Long subcontract chains, responsibility is unclear; smaller projects do not report accidents.
Regulatory framework and the regulator	<ul style="list-style-type: none"> 1) Most requirements / guidelines are not law; hence contractors neglect/ignore 2) Too many regulatory obstacles, unnecessary bureaucracy with no obvious safety benefits, confusion over the role of the different regulators. 3) Less DOSH inspectors, Less enforcement (especially small sites) 4) Penalties are too low to act as a deterrent
Developers	<ul style="list-style-type: none"> 1) Set unrealistically short build schedule; 2) Not interest in safety during the construction phase; 3) Unaware of potential commercial benefits of GOSHM 4) Play no active role in safety on the developments
Designers	<ul style="list-style-type: none"> 1) Poor design quality of temporary works 2) Only interested in the finished structure 3) No consideration to buildability 4) Work too remotely from contractors 5) Poor understanding of the construction process 6) Construction phase safety is not important to designers 7) Design and engineering profession work in isolation from each other and from the contractors
Site Workforce	<ul style="list-style-type: none"> 1) No significant representation (no voice from the operational / bottom level) 2) No impetus to upskill a workforce; leaves Malaysia to work elsewhere / becomes more expensive 3) Low-skilled migrant workforce forms too high a proportion of the workforce 4) Fast rotation of the migrant workforce (work visa requirements and prospect of pay hike when they become more skilled) 5) Workforce of the bottom tier subcontractor does not receive briefings suitable for them (level / language etc.) 6) Too much reliance on work agencies who take no responsibility for safety of the workers they assigned

Question 2: What are the positive and negative aspects of CIDB's Construction Industry Transformation Programme 2016-2020? What are the obstacles to the transformation programme achieving its stated aim of reducing the number of fatal and other accidents in the construction industry by 50% by 2020?

Table 1.9: Feedback from the stakeholders in Malaysia

There are both sides:
Positive side:
1) CITP sets a positive goal
2) CIDB is recognized as being a positive influence on safety
3) CITP provides a very positive and overdue focus on workers' amenities
4) The industry has to start from somewhere and this looks about right
5) Big industry players need to lead from the front for it to succeed
Negative side:
1) How can CITP achieve anything if contractors are unaware of it?
2) A 50% of reduction is not achievable
3) A very challenging target
4) Majority of the industry will ignore it
5) Not achievable by 2020 - too soon.

Question 3: With regard to the introduction of the DOSH guidelines on Occupational Safety and Health in Construction Industry (Management) 2016 (GOSHCIM) guidelines into Malaysian legislation: What issues would prevent GOSHCIM from working in Malaysia, if mandated?

Table 1.10: Feedback from the stakeholders in Malaysia

1) The industry is broadly supportive, but this is a big task
2) Is the industry ready for such a fundamental change?
3) The cost of compliance will rise - will that be accepted by developers?
4) How will the government get developers on their side?
5) Big industry players can positively influence very large supply chains
6) The government has to lead by example
7) 'Champion' companies are needed to lead the way, only a small number of developers have recognized the moral and commercial benefits of adopting such an approach voluntarily. Without the relevant legislation, it is unlikely that other developers will follow.
8) Case studies are needed to help sell the benefits
9) It will not work if not enshrined in legislation
10) Needs strong enforcement by DOSH
11) Penalties for non-compliance need to be increased - the current maximum is not a deterrent
12) Insufficient number of competent designers in Malaysia
13) Designers currently have little appreciation of the construction process
14) Mechanisms are needed for sharing good design practice

The stakeholders from the construction industry provide a wide range of perspectives towards the current scenario in the Malaysian construction industry. The wide range of point of views from the stakeholders clearly demonstrated that the Malaysian construction industry faces significant skills challenges at many levels, particularly, due to the heavy dependency on the unskilled foreign workforce in the construction industry. The current safety and health standards necessary for the development are not at a sufficient scale, or not up to the international standard requirements.

With a broad perspective to assess the major issues related to occupational safety and health in

the construction industry, four Asian countries were selected to compare the percentage of construction fatality cases among construction accident cases (Figure 1.7).

The figure shows the overall percentage of fatality cases in the construction industry among construction accident cases from 2007 to 2018 of selected countries. The construction accident cases include non-permanent disabilities, permanent disabilities, minor and major accidents. The highest workplace fatality numbers were reported on construction sites due to the nature of the industry which involves various types of high-risk activities on a daily basis. In developed and developing countries, fatal cases in the construction industry are the highest among other industries. The progression of Malaysia's construction industry has been hampered by many issues, and safety is one of the major issues arising in the industry which is often overlooked as a major problem. The Malaysian government has been initiating occupational safety and health (OSH) program implementation through standards, laws, rules and regulations; where a list of job tasks that is dealing with high-risk hazard is mandated to obtain certificate of practice by Malaysian Department of Occupational Safety and Health (DOSH). Statistics from the Social Security Organisation (SSO) indicate that 7,338 accidents were reported in the construction industry in 2016, compared with 4,330 cases in 2011, an increase of 69.47 per cent. However, employers in the construction sector tried to keep the accident cases unreported, if take into account the unreported cases. The figure would be higher.

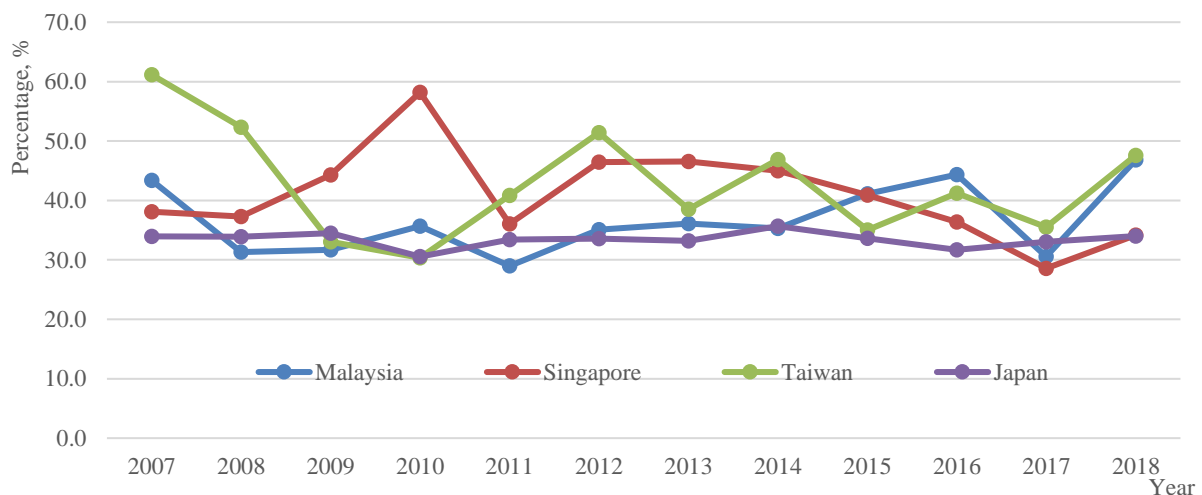


Figure 1.7: Overall percentage of construction fatality among construction accident cases in selected countries from 2007-2018

The highest workplace fatality numbers were reported on construction sites due to the nature of the industry which involves various types of high-risk activities on a daily basis

(Aminbakhsh et al., 2013), especially in developing countries. In developed country such as United States (USA), the percentage of construction fatal cases among construction accident cases is relatively low, this might be due to the stringent education and empower of law and regulations; comprehensive standards with covering a wide range of industries with detailed specification of tools and the standard operation rules responsible by US Occupational Safety and Health Administration (OSHA) (Howard and Hearl, 2012). However, fatal cases in the construction industry are the highest among other industries in both developed and developing countries (Han et al., 2008; Andolfo and Sadeghpour, 2015). The Malaysian construction industry has a tremendous vitality with the positive commercial growth over the last decades, yet, its current safety and health performance is poor relative to international comparison. On the other hand, there are only little signs of improvement despite the efforts of government and authorities to boost the performance. Table 1.11 indicated the overview on the fatal cases in the construction industry and all industries in selected countries, 2007-2018 (Sources: ¹Department of Occupational Safety and Health, (DOSH) Malaysia (2020); ²Ministry of Manpower, Singapore (2020); ³Ministry of Labour, Republic of China, Taiwan (2020); ⁴Japan Industrial Occupational Safety and Health Association (2020); ⁵US Department of Labour (2020); ⁶Ministry of Housing and Urban-Rural Development of the People's Republic of China (2020)).

Table 1.11: Comparison of the construction casualties and fatalities (2007-2018) in selected countries

Year/Cases	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
All sectors -Malaysia ¹	219	230	224	185	176	191	191	204	214	239	206	173	214
Construction sector - Malaysia ¹	95	72	71	66	51	67	69	72	88	106	63	81	72
ratio of construction fatal accidents, Malaysia	43.4%	31.3%	31.7%	35.7%	29.0%	35.1%	36.1%	35.3%	41.1%	44.4%	30.6%	46.8%	33.6%
All sectors -Singapore ²	63	67	70	55	61	56	73	60	66	66	42	41	39
Construction sector - Singapore ²	24	25	31	32	22	26	34	27	27	24	12	14	13
ratio of construction fatal accidents, Singapore	38.1%	37.3%	44.3%	58.2%	36.1%	46.4%	46.6%	45.0%	40.9%	36.4%	28.6%	34.1%	33.3%
All sectors - Taiwan ³	293	320	301	281	319	313	289	268	263	277	256	252	240
Construction sector - Taiwan ³	86	91	90	69	91	95	83	93	80	65	72	75	65
ratio of construction fatal accidents, Taiwan	29.4%	28.4%	29.9%	24.6%	28.5%	30.4%	28.7%	34.7%	30.4%	23.5%	28.1%	29.8%	27.1%
All sectors - Japan ⁴	1357	1268	1075	1195	1024	1093	1030	1057	972	928	978	909	845
Construction sector - Japan ⁴	461	430	371	365	342	367	342	377	327	294	323	309	269
ratio of construction fatal accidents, Japan	34.0%	33.9%	34.5%	30.5%	33.4%	33.6%	33.2%	35.7%	33.6%	31.7%	33.0%	34.0%	31.8%
All sectors - USA ⁵	5657	5214	4551	4690	4693	4628	4585	4821	4836	5190	5147	5250	5333
Construction sector - USA ⁵	1204	975	834	774	738	806	828	899	937	991	971	1008	1061
ratio of construction fatal accidents, USA	21.3%	18.7%	18.3%	16.5%	15.7%	17.4%	18.1%	18.6%	19.4%	19.1%	18.9%	19.2%	19.9%
All sector - China	N/A												
Construction sector - China ⁶	-	778	684	627	589	487	528	522	442	634	694	840	904

*Ratio of fatal cases among all industry (%) by using the construction fatal cases / all industry fatal cases (reported cases)

1.2.1 Ageing Population in Japan

Based on the data provided by the Statistics Bureau of Japan (2022), there were approximately 810,000 employees aged 65 or over employed in the construction industry in Japan while only 210,000 people between the ages of 20-24 employed in the construction industry in Japan in 2022. Studies showed that most of the accidents involving workers of age 55 and above were critical (Sugama and Ohnishi, 2015). This amount reflects the current scenario that the young generation who are involved in the construction industry is far from the elderly due to ageing issues.

1.2.2 Shortage of Skilled Workforce in Japan and Malaysia

The construction sector is expected to expand and play a significant role in creating more employment opportunities for skilled and unskilled workers; meanwhile, Malaysia construction industry is labour-intensive, heavily depended on the use of foreign workers either legally or illegally in the industry, as it is always a major issue in terms of occupational safety and health, labour welfare, laws and regulation and insurance policy. There are always pros and cons, the expansion of the construction industry has created various employment opportunities to foreign workers and boosted the nation's economy, yet it also created various problems. For instance, most of the foreign workers did not undergo any skills training programme after arriving in Malaysia which increased the risks of low quality and productivity in the construction industry. The skill and competency issue went further than the view that the difficulties and poor safety performance of the industry are due to the unskilled nature of the migrant workforce. Particularly, most of the foreign workers either legally or illegally come from the ASEAN region (Abdul-Rahman et al., 2012).

In Japan, the government established Japan Association for Construction Human Resources (JAC) to hire, train and evaluate the non-Japanese nationals as construction technicians to support the construction sites in the Japanese construction industry to be competent persons in order to overcome the national issues of shortage of manpower (JAC, 2023). The Japanese government ensures the foreign workforce undergoes the training program and evaluation of skills before being involved in the industry. In contrast, the foreign workers were not undergone any skills training programme before or and after arrived in Malaysia which increasing the construction accidents leads to poor safety performance, risks of low quality and productivity

and stimulate various social issues politically and economically in the construction industry (Zalk et al., 2011; Ismail and Yuliyusman, 2014; Mohd Najib et al., 2019).

1.2.3 Low Sensitivity among Foreign Workers in Japan and Malaysia

A good safety culture is one of the achievements that can be obtained through the application of an effective safety program since it demands cooperation between management and employees in the implementation of the programmes (Hinze et al., 2013). It is extremely important to identify the factors and elements influencing safety programmes in construction projects in order to improve its operational effectiveness (Bavafa et al., 2018). Therefore, it is important to find out the most appropriate programme factors to improve, monitor and control health and safety in construction projects. In the mid-term review on the 11th Malaysia Plan, Malaysia's government launched the fourth Industrial Revolution (4IR) which will be formulated to promote innovation, creativity and competitiveness in embracing the intensification of the digital revolution. However, some argue that most of the foreign workers are uneducated and unskilled (Ismail and Yuliyusman, 2014), which is an obstacle to improving safety in the construction industry (Pinto et al., 2011).

Some argue that mandatory safety training is necessary to increase the effectiveness of occupational safety and health (OSH) training programmes and to improve workers' knowledge, skills and attitudes (Fardaniah et al., 2018). However, the Malaysian government has tightened and enforced the legislative framework and action plan to cope with the current situation, yet, the critical growth of the fatal accident cases in the construction industry indicated no significant improvement which can be argued as lack of enforcement and effectiveness (Ayob et al., 2018).

1.2.4 Lack of Enforcement toward Safety Focuses on Construction Foreign Workers in Japan and Malaysia

A successful safety programme can significantly decrease the accident rate as it requires management to employ safe construction procedures and prepare a safe working environment for the employees (Al Haadir and Panuwatwanich, 2011). However, the accident rate in the

construction industry is increasing over the past decades; and the nature of the work at construction sites in Malaysia is labour intensive and heavily depended on the workforce of skilled and unskilled with different educational backgrounds and hence has high potential for personal injuries. It is vital to educate and train workers in occupational safety and health related issues as safety programmes implemented by contractors has always been known as one of the most effective strategies to reduce accidents and injuries in construction sites (Bavafa et al., 2018). In Malaysia, the safety related guidelines were drafted in 2017 and implemented in 2020, however, these guidelines are unlikely to make any significant difference to tackle the situation as long as it remains as a voluntary basis and not legislative requirements. The voluntary guidelines are being ignored by the industry players and the current level of penalties for casualties or even fatal accidents are too low to act as a deterrent to non-compliance. On the other hand, the guidelines are still deficiencies in the contractor's current safety and health management system. Lack of enforcement towards safety measures in the construction industry is the key factor leading to an increase in casualties and fatal accidents. According to NIOSH chairman Tan Sri Lee Lam Thye, there was only 20 percent of accidents at construction sites nationwide were reported to DOSH between 2009 and 2014; and with research done by researchers from NIOSH and two public universities, revealed that out of 31,347 accidents cases which occurred in the construction sector in that period, only 787 were investigated by DOSH which is approximately 2.5 per cent. Inadequate attention to the safety and health issues at the industrial level may be the key causes of the persistence of many serious problems in Malaysia construction industry. In other words, the safety performance is still alarmingly poor in the construction industry. The increasing of construction accidents with no effective measures taken would directly bring negative impacts to the company and the industry in long term (Buniya et al., 2021) by contributing to the direct costs such as compensation and insurance to the workers lead to cost overrun (Meng and Gallagher, 2012), and indirect costs through damages to the company's reputation (Ayob et al., 2018), delay of construction project completion (Hamid et al., 2019) and decreased of productivity which lead to the dissatisfaction from public. Therefore, to unfold the predicament by focusing on the current safety and health model in order to determine the root causes of accidents and to provide solutions aimed to mitigate the accident rate in construction industry efficiency.

1.3 Problems Encountered on Construction Sites Associated with Foreign Workers in Malaysian Context

Although the 11th Malaysia Plan for economic agenda aims to create 1.5 million jobs by 2020 in order to improve productivity and tends to reduce the dependency on low-skilled foreign workers, yet, there are still approximately four million of foreign workers in both legal and illegal sectors. According to Bank Negara Malaysia's 2014 annual report, there were around two million registered foreign workers in Malaysia, and according to a past statement by the Immigration Department, the illegal foreign workers were estimated to be over two million in Malaysia. 70% of foreign workers employed are engaged in three sectors namely manufacturing (36%), construction (19%) and plantation (15%) (The World Bank, 2020).

The 12th Malaysia Plan report uncovered the number of registered foreign workers as approximately 1.48 million (9.9%) of the total workforce in Malaysia at the end of 2020 (Ministry of Economy, 2023). However, the number of foreign workers is expected to be even larger of the undocumented foreign workers, equal or exceed the number of registered foreign workers in Malaysia (Surendran, 2021). Based on the Work Bank report (2020), the total number of foreign workers estimated at 1.23 million to 1.46 million (out of an estimated number of 2.96 million to 3.26 million foreign workers in 2017) were estimated as illegal foreign workers (The World Bank, 2020). The Ministry Labour Recalibration Programme has received 212,926 applications from illegal immigrants who are mainly for the construction industry, where 122,075 application which enables the foreign workers to be legalised in the construction sector, said by Home Minister Datuk Seri Hamzah Zainuddin in 2021 (Jalil, 2021). The Malaysian government aims to cap the foreign labour employment below 15% of the total workforce under the latest 12th Malaysia Plan (Surendran, 2021). The presence of a large pool of foreign workers mainly employed in sectors that are difficult to recruit local workers, particularly the construction sector.

There is no doubt that the uncontrolled influx of foreign workers into Malaysia may lead to problems associated with political and socio-economic problems (Laxmi, 2021). The challenges faced by the local construction industry in overcoming several pitfalls such as limited safety awareness and enforcement; insufficient attention to building construction quality; poor environmental management; heavy administrative and regulatory burdens and negative public perception of the industry as a whole (CIDB, 2018).

1.3.1 Lack of Enforcement towards Safety Measures on Construction Sites

Other issues such as lack of safety and health awareness have been identified as a major cause of construction accidents (Goh et al., 2016). Sufficient safety and health awareness is crucial in terms of preventing accidents by creating a safer construction working environment (Chen and Jin, 2013), that has brought impacts on the implementation of safety and health programmes where it enables to determine the behaviour of workers and organisations (Smallwood, 2014). Yet, the awareness among contractors on the need for safety and health training is not satisfactory (Hamid et al., 2008) where contractors would rather scarify the budget allocation for the OSH programme, as some contractors thought the construction safety and health awareness can be gained from working experiences. In this way, it is unclear what the construction site managers' view of these issues is. This study also aims to understand the awareness of practitioners in this regard.

1.3.2 Insufficient of Safety Training Programme/Activities

Malaysia has abundant experience in conducting international training courses, yet, there are still scopes for improvement. Firstly, many of them transfer specific knowledge and introduce the latest trends but lack sufficient discussion on why and how such knowledge or trends have come about. Without such discussion, there is still a large gap in understanding on how current knowledge and trends in Malaysia could be applied to reality. This gap tends to discourage participants from being interested in the possibility of utilising what they have learnt. Besides, many training courses are lecture-based that tend to offer limited opportunities for the participants to think for themselves and carry out discussion among themselves on background contents and possible use of the information given in the lectures. For instance, the effectiveness of the Safety and Health Officer (SHO) and the Site Safety Supervisor (SSS) are competence to perform their responsibilities to influence the safety and health performance in the construction industry, are their responsibilities being assessed? Develop construction-specific safety training curricula and roll out training courses to increase the quality and quantity of certified safety officers and third-party OSH inspectors.

1.3.3 The Requirement of Recruiting Foreign Workers is Loose Leads to Influx of Foreign Workers

Malaysia relies heavily on foreign labourers, especially in the construction industry where not many residents opt to work in this industry due to low-wages, long working hours and danger (Williams et al., 2017; Hamid et al., 2019). The trend of employed persons in the Malaysian construction industry is increasing from 1982-2021 (Figure 1.8). According to the Immigration Department of Malaysia (Immigration Department of Malaysia, 2021), the recruitment terms and conditions of foreign workers are age between 18 - 45 years at the time of application; must come from approved source countries such as Thailand, Indonesia, Vietnam, Myanmar etc.; certified pass for the immigration security clearance (ISC) prove as fit and health by the approved medical centre in their home countries; not listed as foreign individuals who are prohibited under Immigration Act. The specific skill training program or qualification to work at a specific industry for the foreign workers are not reflected in the recruitment terms and conditions. The foreign workers were not receiving any training after arriving in Malaysia that would lead to negative impacts in terms of safety, productivity and quality assurance in the construction industry (Abdul-Rahman et al., 2012). Malaysians need these foreign workers in the construction industry, but do not recognize them as wanted (Dannecker, 2005). The presence of foreign workers is the most critical concern facing the Malaysian construction industry as the poor quality of unskilled foreign workers is the weakness in exchange of cheaper workforce (Abdul Rahim et al., 2011; Khosravi et al., 2014).

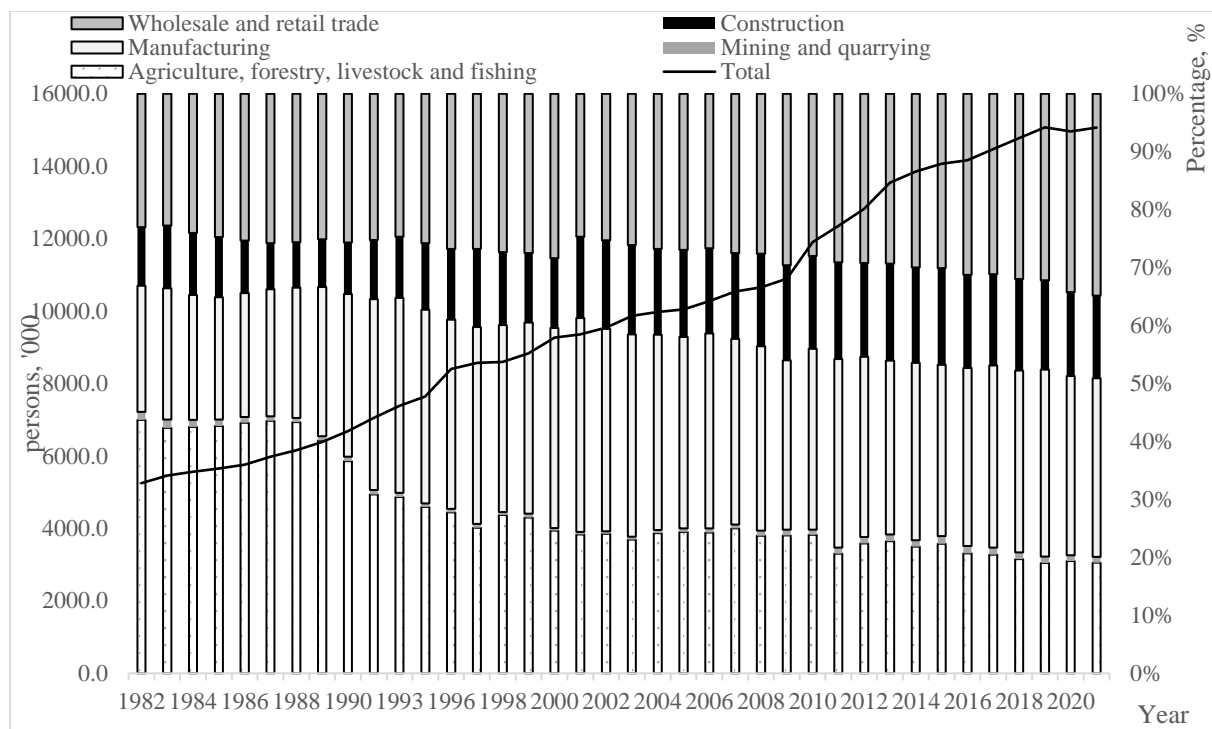


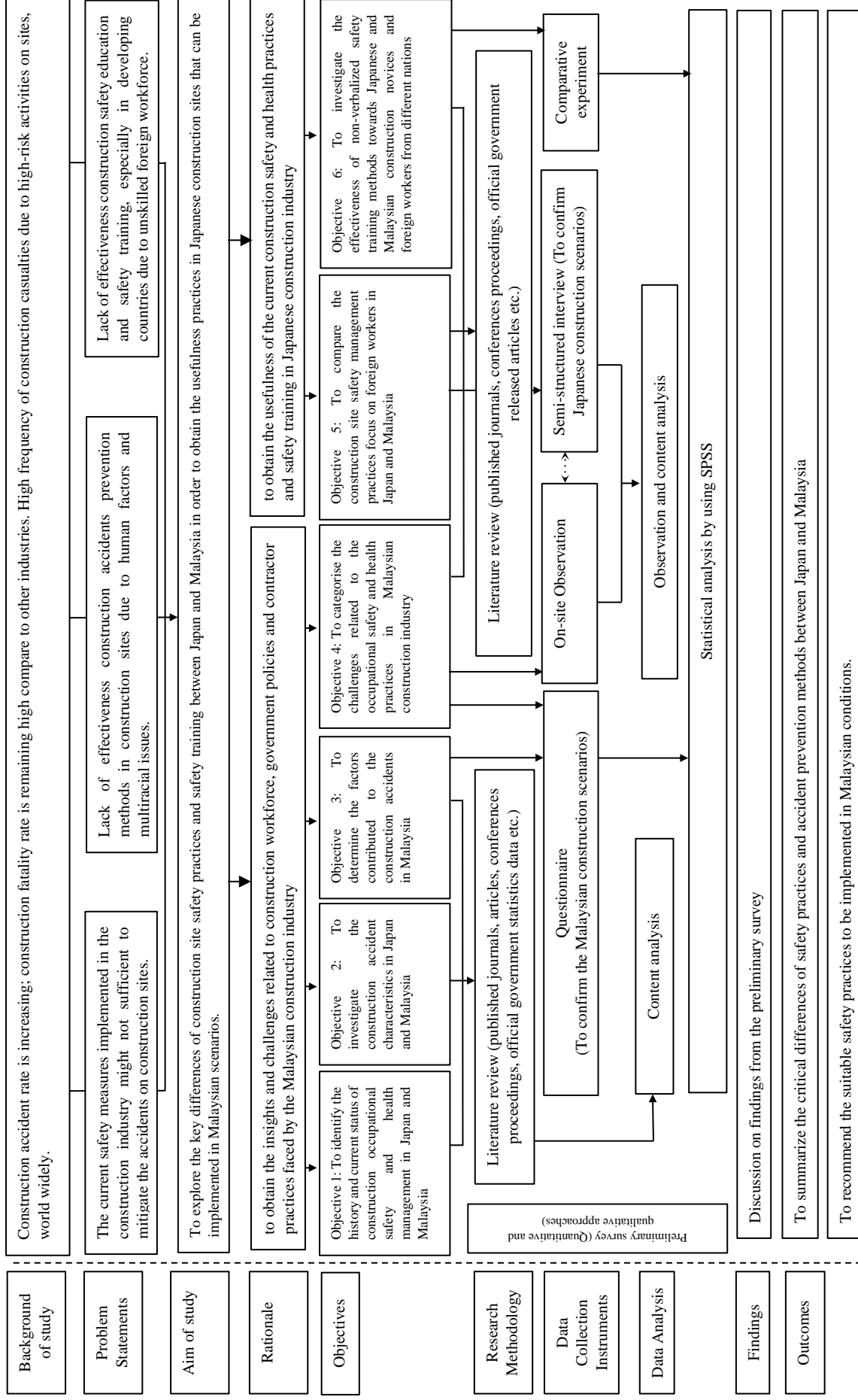
Figure 1.8: Employed person by industry ('000), Malaysia, 1982-2021

1.4 Look East Policy

In view of the Malaysian “Look East Policy” was an economic policy announced and advocated by former Prime Minister of Malaysia, Tun Dr. Mahathir Mohamad in 1990s, who recommended an initiative to learn from the experiences, skills and techniques in various fields of Japan in the nation-building of Malaysia and to improve the relationship between Japan and Malaysia. The participation of Japanese construction companies boosts the rapid development of the Malaysian construction industry in line with the policy, for instance, the remarkable twin skyscrapers, Petronas Twin Towers were constructed by Japanese construction company (Tower 1) and Korean construction company (Tower 2) which completed in 1996. It is compared to the situation on Japanese health and safety to be preceded by construction technology to consider the Malaysian circumstances. In this regard, this study will be directed towards the “Look East Policy”, which will be used to explore how the Japanese construction industry can effectively control, minimise, enhance, promote and maintain safe practices on construction sites, and how to educate construction site workers to maintain effective and safe practices on a daily basis.

1.5 Outlines of Study

This study mainly focuses on the safety issues related to construction sites practices and construction site personnel who work on site on a daily basis. To explore the key differences of construction site safety practices and safety training between Japan and Malaysia in order to obtain the usefulness practices in Japanese construction sites that can be implemented in Malaysian scenarios. The outlines shown in the figure present the entire study flowchart.



Chapter 2 Safety Issues Lead to Construction Accidents

This study aims to compare the situation and approaches toward the construction occupational safety and health in developed and developing countries to gain knowledge that will contribute to the reduction of construction accidents in developing countries. In particular, it is significant for developing countries to understand the state of the construction occupational safety and health environment in-line with the economic growth and economic stability. This chapter focuses on Japan as an example of a developed country and Malaysia as an example of a developing country. The review on the trends and types of construction accidents in Japan and Malaysia, the legal and other systems related to occupational safety and health, to understand the similarities and differences in the construction occupational safety and health environment in Japan and Malaysia. It will then discuss the findings that are useful for improving the prevention of construction accidents in Malaysia today. This chapter aims to achieve the following objectives: (1) to examine the occupational safety and health relevant safety and health government agencies, policies and construction site safety management organisations in construction industry in Japan and Malaysia; (2) to study the construction accident trends and fatalities types in Japan and Malaysia; (3) to explore the workforce participation and related issues in construction industry in Japan and Malaysia; (4) to determine the effects of construction accidents towards construction company in Malaysia. The database and document search method were established on the availability of government documents or journal-published articles including websites of labour safety-related organisations in this study. The construction casualties including permanent, non-permanent injuries and fatalities occurred on construction sites were collected to obtain the current Japanese and Malaysian construction accident trends. The data extracted from the Department of Occupational Safety and Health (DOSH), Malaysian Social Security Organisation (SOCSO), Institute of Labour Market Information and Analysis (ILMIA), Department of Statistics (DoS) Malaysia and Japan Industrial Safety and Health Association (JISHA) from Industrial Safety Site of Ministry of Health, Labour, and Welfare (MHLW), Safety Division, Industrial Safety and Health Department, Labour Standards Bureau, Japan. The data were analysed by content analysis method and frequency distribution analysis.

2.1 Construction Occupational Safety and Health Government Agencies in Japan and Malaysia

The existing safety regulatory bodies and government agencies in Malaysia namely National Institute of Occupational Safety and Health (NIOSH), Department of Safety and Health (DOSH), National Council for Occupational Safety and Health (NCOSH), Construction Industry Development Board (CIDB) are playing a vital responsibility in managing safety and health issues in construction industry. The following table summarises the purposes, roles and responsibilities on safety and health in the construction industry. Table 2.1 and Table 2.2 indicated the purposes, roles and responsibilities of OSH bodies in Malaysia and Japan.

Table 2.1: Purposes, roles and responsibilities of OSH bodies in Malaysia

Malaysian OSH bodies and authorities	Purposes (P), Roles and Responsibilities (R&R)
NIOSH ¹	P: To provide training activities, information pooling and dissemination, research and development in occupational safety and health at the workplace. R&R: To promote a safe and healthy workplace and workforce in Malaysia; to assist employers and employees to manage OSH in their organisation effectively; to provide Quality Solutions related to OSH issued with a pragmatic approach which are reasonable and practicable; to conduct evaluation exercises to ascertain the quality of the persons undergone training at NIOSH.
DOSH ²	P: To ensure the safety, health and welfare of people at work and to protect other people from dangers regarding the activities of various sectors. R&R: Reviews the policies and legislations of OSH; carry out research and technical analysis; promote the relevant programmes to stakeholders to enhance the awareness of occupational safety and health.
NCOSH ³	P: To improve the level of awareness of occupational safety and health; to ensure the safety of all workplaces in Malaysia; to become the prime mover in steering the nation through tripartism, forming a safe and healthy work culture and raising Malaysia's quality of life. R&R: the highest forum in the Ministry of Human Resource where tripartite (<i>the collaboration between unions, employers, and the governments</i>) discussions are held about issues related to the Act 514, direction, national policy and the implementation of occupational safety and health in Malaysia.
CIDB ⁴	P: To regulate, develop and facilitate the construction industry towards achieving global competitiveness. R&R: To advise and make recommendations to the Federal and State governments regarding the matters related to the construction industry.

Sources:¹National Institute of Occupational Safety and Health (NIOSH), (2023). Available online at <http://www.niosh.com.my/>;
²Department of Occupational Safety and Health (DOSH), (2023). Available online at <https://www.dosh.gov.my/index.php/about-us/dosh-profile>; ³National Council of Occupational Safety and Health (NCOSH), (2023) Available online at <https://www.dosh.gov.my/index.php/about-ncosh/latarbelakang>; ⁴Construction Industry Development Board (CIDB), (2023). Available online at <https://www.cidb.gov.my/eng/functions/#:~:text=To%20regulate%20the%20implementation%20of,appropriate%20actions%20to%20address%20it>.

Table 2.2: Purposes, roles and responsibilities of OSH bodies in Japan

Japanese OSH bodies and authorities	Purposes (P), Roles and Responsibilities (R&R)
JISHA ¹	<p>P: to improve occupational safety and health through promotion of voluntary occupational accidents prevention activities by employers; to eradicate occupational accidents and diseases in accordance with the industrial accident prevention organisation act; to prevent occupational accidents by supporting OSH activities of business establishment to align with the JISHA's management philosophy of "Safe work and safe life for all workers, Safe Work, Safe Life"</p> <p>R&R: To support for the introduction of risk assessment and establishment of occupational safety and health management system; to provide physical and mental health promotion and mental health measures; to promote of OSH education; to assist in the introduction and operation of Zero-accidents campaigns; to provide JISHA's on-demand technical services; to conduct international cooperation; to assist small and medium-sized enterprises; to disseminate of publications and provision of the latest information; to investigate of chemical substances for toxicity and safety testing.</p>
JCOSHA ²	<p>P: Established with employers in the construction industry and their organisations as its members to prevent occupational accidents in the construction industry.</p> <p>R&R: To establish regulations on occupational safety and health; to offer support and guidance concerning measures for worker safety and health, to assist the occupational accident prevention activities of contractors and their groups by voluntarily engaging in variety of initiatives to promote the industrial accident prevention activities of contractors, employers and organisations;</p>
JNIOH ³	<p>P: To protect workers' safety and health by promoting scientific investigations and research activities.</p> <p>R&R: to conduct scientific research activities to contribute administrative duties for the government and for workers in industries, for risk reduction of industrial accidents and diseases, to promote workers' health and creating safer and comfortable work environments.</p>

(Sources: ¹Japan Industrial Safety and Health Association (JISHA), (2023). Available online at https://www.jisha.or.jp/english/activities_jpn.html; ²Japan Construction Occupational Safety and Health Association (JCOSHA), (2023). Available online at <https://www.kensaibou.or.jp/eng/index.html>; ³Japan National Institute of Occupational Safety and Health (JNIOH), (2023). Available online at <https://www.jniosh.johas.go.jp/en/about/about.html>

Policies in related OSH Government Agencies in Malaysia

NIOSH Policy in Malaysia

The safety and health policy are taken from the NIOSH official website (NIOSH, 2023) (Table 2.3). Taking into account statutory requirements and relevant national and international standards and codes of practices, NIOSH is committed to ensuring a safe and healthy work environment for all employees and others involved or affected by the operation (NIOSH, 2023). The core activities provided by NIOSH include training, consultation, research and development, information dissemination and examination.

Table 2.3: OSH policy by NIOSH in Malaysia

OSH policy	<ul style="list-style-type: none"> -The implementation and effectiveness of policy is a line management responsibility together with the participation and involvement of all employees and NIOSH will ensure that adequate resources, training and time are made available. -OSH matters will be given equal priority with other major business objectives. -Safety and Health management systems and programs will be regularly reviewed to ensure continuous improvement. -Humanistic approach will be adopted by NIOSH to promote a safe and healthy work culture where employer and employees share the common responsibility of creating a better work environment for all. -The policy will be monitored to ensure achievement of the objectives and reviewed in light of legislative or organisational changes.
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(Source: NIOSH, 2023) Available online at <http://www.niosh.com.my/corporate-info/niosh-policy/safety-and-health-policy>

2.1.1 Organisational Charts

NIOSH Organisation Chart in Malaysia

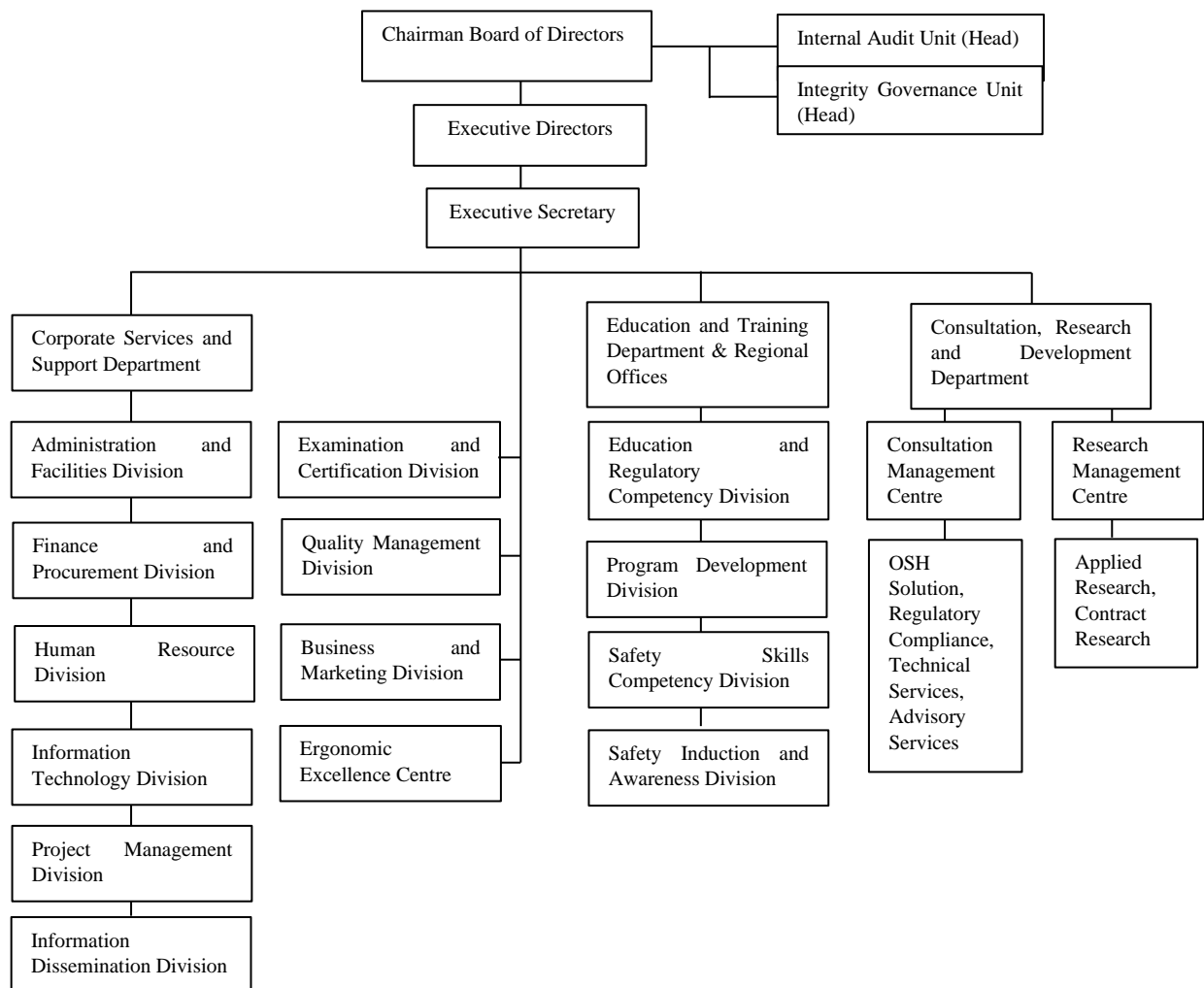


Figure 2.1: Organisation chart of the National Institute of Occupational Safety and Health (NIOSH), Malaysia

(Source: NIOSH, 2023) Available online at <http://www.niosh.com.my/corporate-info/organisation-chart>

DOSH Policy in Malaysia

The Department of Occupational Safety and Health (DOSH) aims to continuously enhance the quality of products, services and safety and health performance of staff alongside the relevant persons. Both management and staff members will work together in preventing any potential non-conformity of products and services, and any possibility

of injury arising from incidents occurring at workplaces (DOSH, 2023). To ensure the implementation of the policy, the QSH management system is created, implemented and maintained by the DOSH. The DOSH is committed to the following (Table 2.4):

Table 2.4: QOSH policy by DOSH in Malaysia

Quality, Occupational Safety and Health (QOSH) Policy	<ul style="list-style-type: none"> -Provide and maintain a quality, safe and health workplace and system free of any hazard and risk; -Ensure all staff receive relevant information, directives, trainings and supervision on how to carry out tasks in a correct and quality manner that poses no risks to health; -Investigate all non-conformities of products and services, incidents, occupational diseases, occupational poisoning and dangerous events, and taking steps to ensure that are not repeated; -Identify and comply with customer requirements, and legal and other requirements as stipulated in the Occupational Safety and Health Act 1994, its regulations and the approved industrial codes of practices; -Promote and achieve the objectives of occupational safety and health quality, work procedures, and rules and guidelines of occupational safety and health among workers across the country.
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(Source: DOSH, 2023) Available online at <https://www.dosh.gov.my/index.php/about-us/dosh-policy>

DOSH and JCOSH Organisation Chart in Malaysia and Japan

The role of occupational safety and health has been in existence since the late 19th century started with steam boiler safety, machinery safety and followed by industrial safety, industrial safety and hygiene and the recent occupational safety and health covers almost all industries in Malaysia (DOSH, 2023). The Department of Occupational Safety and Health (DOSH) Malaysia is one of the government agencies that are responsible to protect the person at work from hazards arising from the economic activities; and provide safety, health and welfare under the Ministry of Human Resource Malaysia. The Japan Construction Occupational Safety and Health Association (JCOSHA) was established in accordance with the provisions of the Industrial Accident Prevention Organisation Law by 1964. The JCOSHA was established with employers in the construction industry and their organisations as its members to prevent industrial accidents in the construction industry by voluntarily engaging in various types of initiatives to promote the accident

prevention activities of contractors and their organisation.

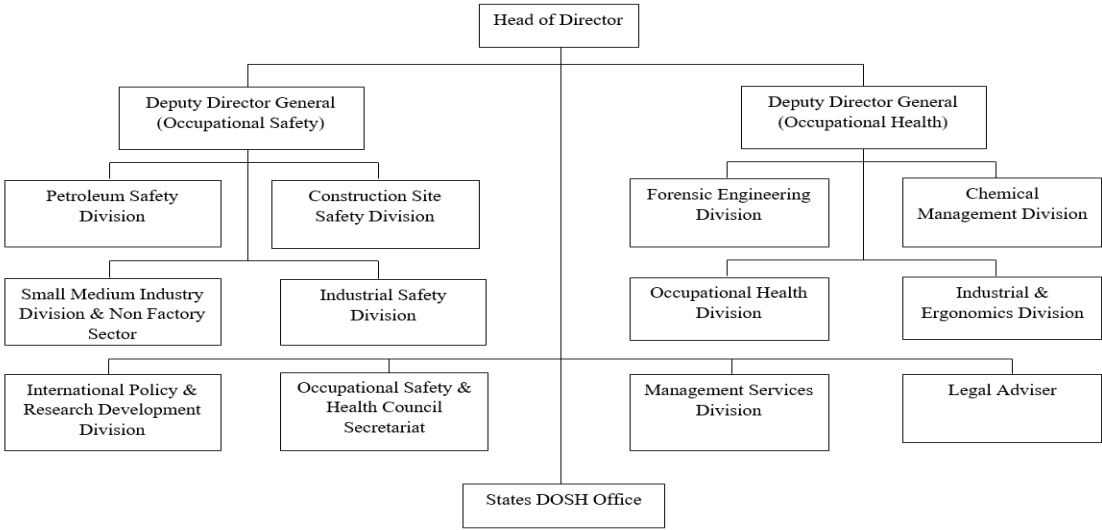


Figure 2.2: Organisation chart of the Department of Occupational Safety and Health (DOSH), Malaysia

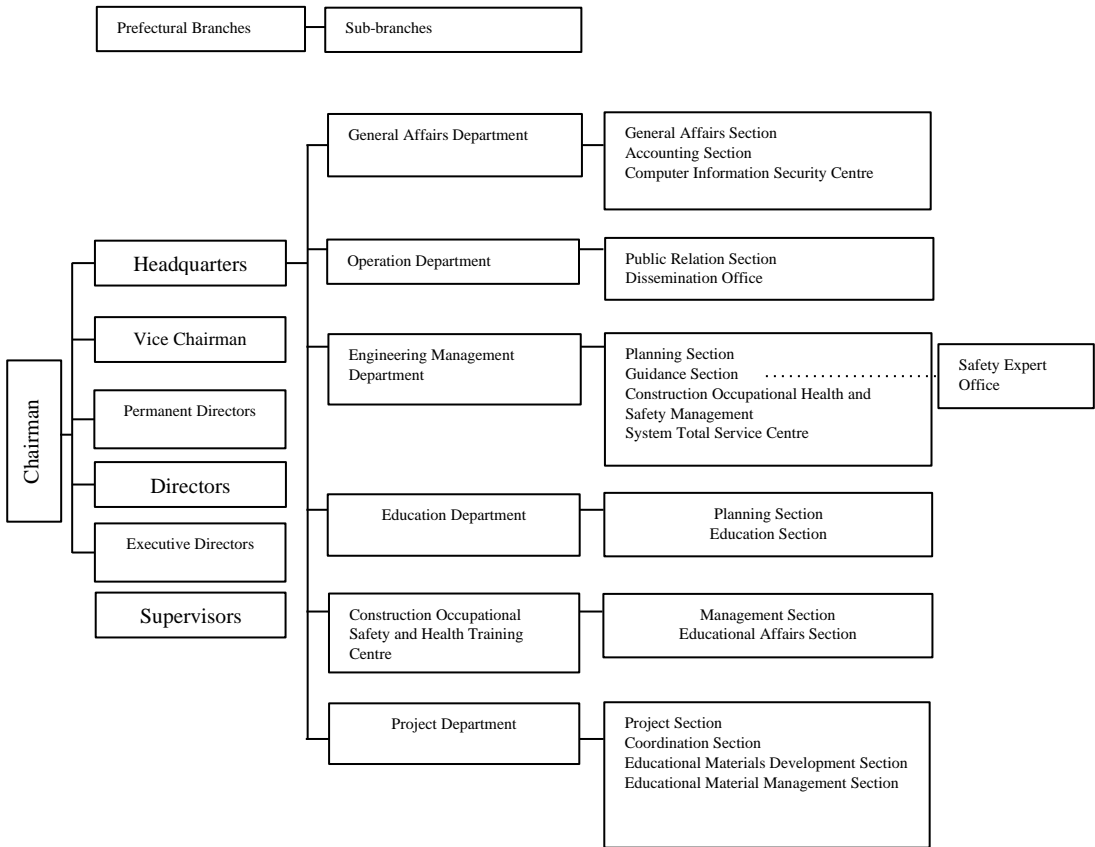


Figure 2.3: JCOSH Organisation Chart in Japan
(Source: JCOSH, 2023) Available online at
https://www.kensaibou.or.jp/eng/association_info/index.html

JNIOOSH Organisation Chart in Japan

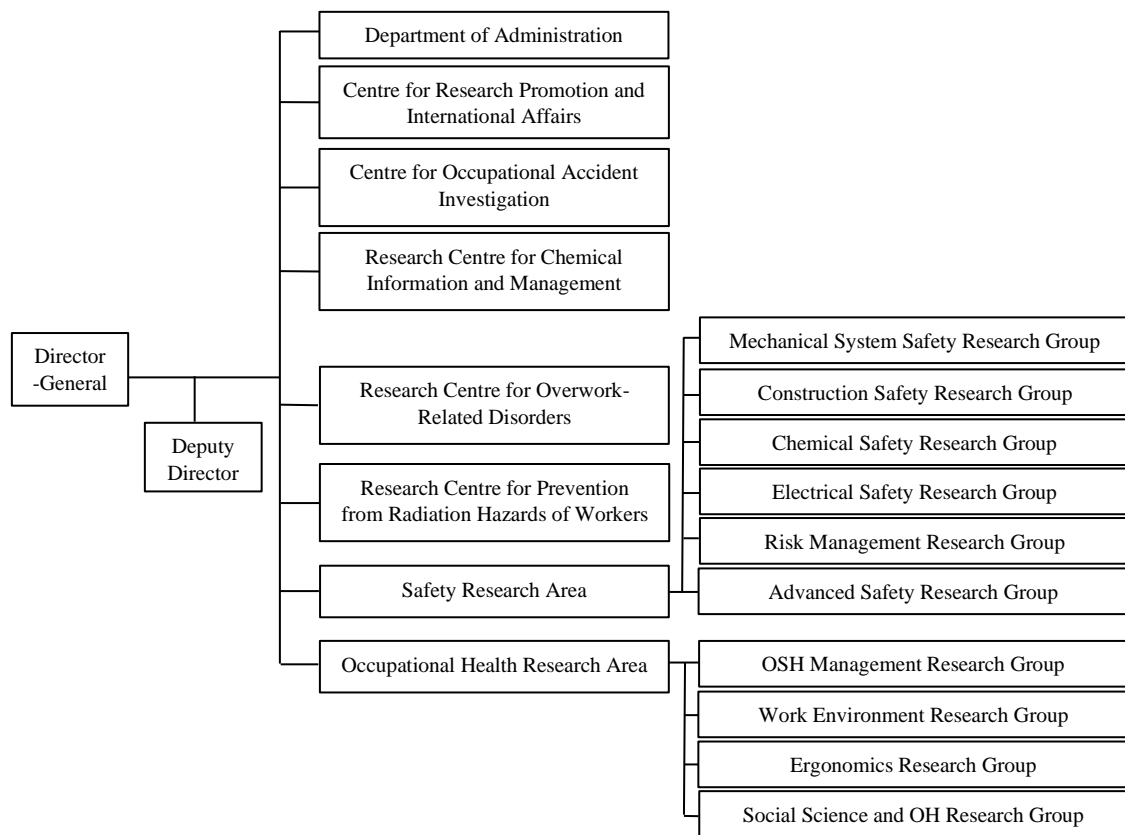


Figure 2.4: JNIOOSH Organisation Chart in Japan (Source: JNIOOSH, 2023) Available online at <https://www.jniosh.johas.go.jp/en/about/organisationChart.html>

By comparing both organisations' charts (Figures 2.1-2.4), the Japanese government arranges many departments that manage the safety and health related; while in Malaysia, the organisation chart is minimum to the requirement where DOSH will be the authorities to carry out accident investigation on the construction casualties and fatalities. From the JNIOOSH organisational chart, it can be claimed that the Japanese government put a lot of effort in accident prevention by different departments to handle a variety of research focused on different areas.

2.1.2 Construction Site Safety Management Typical Organisational Charts in Japan and Malaysia

Safety and health managers or safety supervisors must be appointed at site in most of the construction sites to ensure the workers' safety. In Malaysia, the regulations (Section 29 under OSHA 1994) prescribe the requirements for employing a qualified safety and health officer (SHO) or a competent person to ensure the safety and health of persons at workplaces when the total contract price of the project exceeds twenty-million-ringgit Malaysia. The main contractor must have employed the SHO or site safety supervisor (SSS) at the workplace who reports to the site manager or project director to manage matters relating to the workplace including all trades in construction sites (Figure 2.5). The SHO must be registered with DOSH and possess such qualifications or received training recognized by the Ministry of Human Resources. The competency of a SSS must be a person who has successfully completed a course carried out by the instructor registered with DOSH and passed the examination conducted by an institution recognized by DOSH. Nevertheless, a person cannot hold a certificate of registration as SHO and SSS at the same time stipulated by DOSH. In addition, the establishment of a safety and health committee at the workplace, if there are forty or more persons are employed at the workplace or the Director General from DOSH directs the establishment of such a committee at the workplace. However, the requirements to be on the committee such as the numbers of the committee or the qualification are not mentioned in the Act.

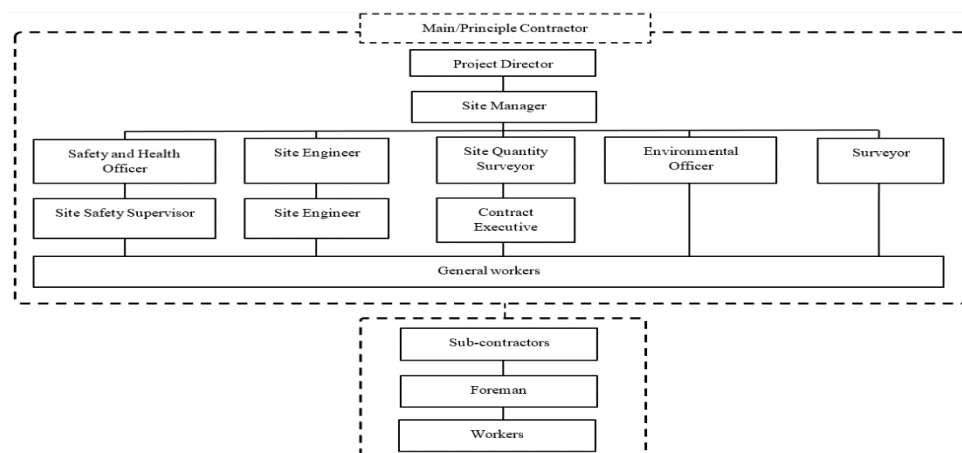


Figure 2.5: Construction project organisation chart in Malaysia *(modified by the author based on the interview)*

Japan Industrial Safety and Health Act (JISHA) provides a comprehensive explanation of the organisation for safety and health management in Chapter 3 that prescribes the appointment of various specialised persons (Ojima, 2020). In Japan, the Overall Safety and Health Controller must be the same person who controls the overall execution of the undertaking at the workplace (Article 10) shown in Figure 2.6. Moreover, the sub-contractors must appoint a safety and health officer (SHO) (Article 16). No special qualifications or certifications are required to fulfil these roles. In addition, the sub-contractor must have a chief engineer (Article 26 of the Construction Business Act) and the chief engineer must be a person graduated from a designated department at high school or above, or to have obtained a designated qualification. The sub-contractor's SHO and chief engineer are often concurrently held by the foreman. There is no legal establishment that places a foreman on a construction site, but he must be a person who directly guides or supervises workers in operations (Article 60 in Industrial Safety and Health Act). The main contractor is required to provide education on the contents of Article 40 of the Industrial Safety and Health Regulations to new foreman. In recent years, the JCOSHA and other organisations provided additional education to improve the capabilities of foreman and SHO. The main contractor must set up a safety and health committee at construction sites of a size specified by government ordinance (Article 19 of the Construction Business Act). This committee is made up of several members including general safety and health manager, the employer shall appoint safety officers and health officers, industrial physicians, and workers who possess experience in safety and health. As such, the Japanese government has a legal system in place to support the voluntary management of safety and health on construction sites. The Japanese government has set up 325 Labour Standards Inspection Offices across the country to monitor occupational safety and health at worksites.

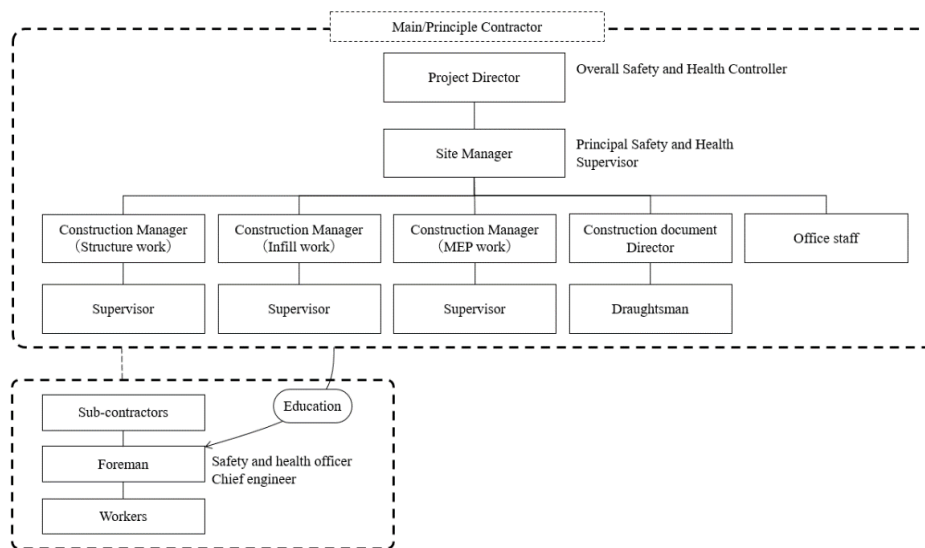


Figure 2.6: Organisation chart of Japanese construction site *(modified by the author based on the interview)*

2.2 Construction Accidents Characteristics in Japan and Malaysia

Definition of Accident Rate in Japan and Malaysia

Workplace accident refers to an unexpected, undesired, unplanned, unavoidable event that sudden occurrence in the premise caused by unusual, unsafe acts or conditions in the progress of an industrial activity, leading to different level of danger such as fatal or non-fatal injury and loss to workers, the public or the environment (Heinrich, 1931; Heinrich and Peterson, 1980). Accidents occurred to construction workers unintentionally and improvised during any activities on site due to unsafe behaviour and unsafe conditions or both. Construction industry is known to be accident-prone consequent upon the dangerous activities taking place at the construction stage. Occupational accidents of diverse categories do take place on the construction sites which result in fatal and non-fatal injuries.

In Japan, the number of fatal accidents based on the Final Accident Report released by the jurisdiction Labour Standards Inspection Office when a fatal occupational accident is identified by a survey that carried out in the occurrence of the Report of Worker Casualties, etc.; the number of accident represented a total number of casualties of 4 days

or more on leave as determined from the Report of Worker Casualties that submitted by the business operator to the Labour Standard Inspection Office Under its jurisdiction. The accident rate is the estimated number of fatal and injured victims (4 days or more off) per 1,000 workers per year, while the fatal rate is the estimated number of fatal accident victims per 100,000 workers in a year.

In Malaysia, the accident is interpreted as an occurrence arising out of or in connection with work which results in fatal injury or non-fatal injury, stated in the Occupational Safety and Health Notification of Accident, Dangerous Occurrence, Occupational Poisoning and Occupational Disease Regulation 2004 (DOSH, 2004). The fatal injury interpreted as the injury leading to immediate death or death within one year of the accident; the non-fatal injury is a lost-time injury which prevents a worker from performing normal work and leads to permanent or temporary incapacity for work or a no-lost time injury where no work time is lost beyond that is required for medical attention. The number of accidents and fatality are based on occupational accident data provided by the Department of Occupational Safety and Health (DOSH) Malaysia.

The above can be seen that these two countries have different levels of caution for accidental accidents. In Japan, the review of casualty data is faster and there is a time limit for accidents, and the accident data is based on direct reporting by business operators to the Labour Standards Supervisory Authority, while in Malaysia, the number of accidents and fatalities is based on a one-year period and is based on the data provided by the Malaysian Department of Occupational Safety and Health (DOSH). Therefore, there is a risk of non-transparent accident data in Malaysia. Therefore, the accident data in Malaysia is not transparent and highly risky.

Fatalities in Construction Industry

Fatalities are the most serious safety incidents in the construction industry, and analysing these incidents and learning from them has proved to be an effective way of diagnosing current safety problems (Dong and Jason, 2014). Researchers in different studies have revealed that the fatality rate in the construction industry is extremely high (Camino

López et al., 2008; Pinto et al., 2011; Zhou et al., 2015). The proportions of accidents on construction sites in developing countries are relatively high (Gangolells et al., 2010). Despite the existence of OSH laws, accident frequency in construction still remains at high level. According to Department of Occupational Safety and Health (DOSH) the Malaysian construction industry recorded with the highest rate of fatality between 2010 and 2018 is considered as one of the most dangerous industries in recent years; while the fatalities in Japanese construction industry declined gradually since after 1972 and remained low until present after the enforcement of the Industrial Safety and Health Act (JISHA 1972) and the implementation of Industrial Accident Prevention five year plan.

Construction Accidents Analysis

A content analysis was performed to convert the unstructured accident data into a detailed format that can be analysed (Stemler, 2015). Statistical analysis is used to determine the characteristics of accidents and to pave the way for accident prevention (Shao et al., 2019). Statistical analyses have been widely used in accident prevention in order to provide a reference for different fields. There is an urge to investigate the characteristics of construction accidents to promote safety in construction and to reduce fatalities.

Previous studies have examined statistical analyses of construction accidents. Researchers determined effective analysis methods for Chinese construction accidents by providing detailed causes of the accident and established the relationship between the accidents causes (Zhang et al., 2019); researchers developed a comprehensive general model of the development of an accident situation based on the European Statistics to tackle different possible events occurring in accident processes in the construction industry and determined the most probable scenario of the accidents (Hoła and Szóstak, 2014). In the Netherlands, the authorities have focused on collecting accident scenario data by analysing the investigation carried by the inspectorate of the Ministry of Social Affairs and Employment (Bellamy, 2015). Accident analysis needs a vision or model of the framework an accident is going to fit into. Therefore, accidents can be reused over and over again in many different frameworks for identifying patterns in the

data and categorising them.

The objective of this chapter was to investigate the construction site accident characteristics, accident trends, and accident types and the related factors that contributed to the accidents based on the statistical data in order to provide a facilitating review on the countermeasures towards the accident trends and accidents reported to relevant authorities. The industrial accidents cases from 2007 to 2022 reported to the Department of Occupational Safety and Health (DOSH) Malaysia, Japan Industrial Safety and Health Association (JISHA) will be the target survey for this chapter. The detailed information of the accidents such as the number of workers who involved in each accident, man working hours, size of the projects, construction contract amounts are not understood, therefore, the considerations must be taken on the following point concerning the statistical presented:

- 1) The industrial accidents cases including permanent disability, non-permanent disability and fatality reported to DOSH and JISHA only.
- 2) The causes of the accidents were based on the description after the investigation by DOSH
- 3) The reported industrial accident cases were not represented directly to the entire industrial accidents.

Researchers investigated the accident frequency rate of construction accidents between 2008 to 2012 in all countries of the European Union and found out the fatality rate was recorded at 6 people per 100,000 workers in the construction industry (Hoła and Szóstak, 2015). In China, there were almost 6,005 fatal accidents causing more than 7,275 workers deaths in the construction industry between 2010 to 2019, where Qinghai and Hainan experienced a higher fatality rate due to the economic growth (Xu and Xu, 2021). In Korea, the high fatality rate in the construction industry is one of the major concerns of the government (Jo et al., 2017). The high fatality rate in the construction industry is alarming in Malaysia as a developing country. On the basis of statistical data in 2021, the rate of occupational injuries recorded 1.98 per 1,000 workers in the construction industry; but the fatal rate recorded 6.30 per 100,000 workers died in the Malaysia construction industry. This value is much higher than the fatality rate for all occupational sectors of

the national economy which equal to 2.00 per 100,000 workers (Department of Statistics Malaysia, 2021). The construction workers are vulnerable to safety and health risks especially the high incidence of occupational accidents in the construction industry.

The construction industry recorded the highest fatality rate among the rest of the industries in Malaysia; although the manufacturing industry encountered a higher number of occupational accidents due to the large volume of workers involved (Figure 2.7). The reported accidents to the Department of Occupational Safety and Health (DOSH) Malaysia including the fatal, permanent disablement and non-permanent disablement in all the economic activities. Based on the occupational accident statistics data, a total of 1,201 construction fatal cases, 111 of permanent disability cases and 1,550 of non-permanent disability cases were recorded between 2010-2021. Statistically, the construction accident cases recorded 326 in 2019 which increased almost 50% compared to 2012 (177 cases); and the fatal cases recorded a steady increase from 67 cases in 2012 to 118 cases in 2018 (Figure 2.8). DOSH only investigated about 214 construction fatal cases within 2010-2020 (DOSH, 2022). Among the investigated construction fatal cases, the frequency and the accidents types were range from 92 of fall from height cases (43%), 30 of crushed by (14%), 26 of hit by cases (12%), 23 of struck-by cases (11%), 11 of buried cases (5.1%), 8 of electrocution cases (3.7%), 7 of structure collapsed cases (3.3%), 6 of drowning cases (2.8%), scaffolding collapse, explosion, burn and others.

Fall from height is one of the critical accidents found in the construction industry (Nadhim et al., 2016; Muhamad Zaini et al., 2020). Government has tightened the legislative framework and action plan to cope with the current situation, yet, the critical growth of the fatal accident cases in the construction industry over the past decade indicated that there is no significant improvement from the previous OSH Master Plan which can be argued as lack of enforcement and lack of effectiveness.

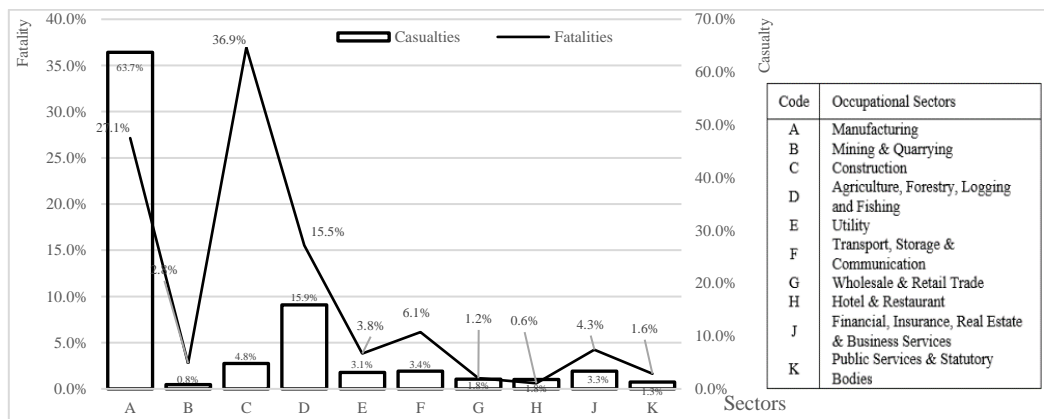


Figure 2.7: Rate of casualties and fatalities in all sectors (2007-2022 until March) reported by DOSH, Malaysia (Source: DOSH, 2022)

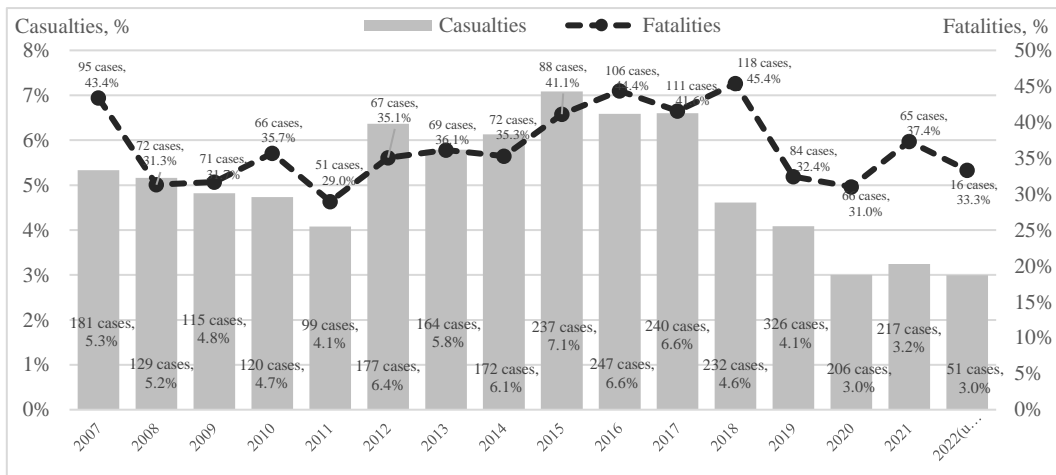


Figure 2.8: Casualties and fatalities in construction industry among all industries by year in Malaysia (2007-2022 until March) (Source: DOSH, 2022)

Construction Accidents in Japan

According to Japan Industrial Safety and Health Association (JISHA), the number of injuries and fatalities for all industries started to reduce after the establishment of Industrial Safety and Health Law (1972). The trend of the accident cases and fatal accident cases in the Japanese construction industry shows in Figure 2.9. For instance, in the construction industry, the annual number of accident cases recorded of 79,781 and 1,106 fatal cases in 1983 has been steadily decreasing to 15,183 accident cases and 269 fatal cases in 2019. In addition, the 13th Occupational Safety and Health programme was

launched in 2018, that is a five-year programme aims to reduce the fatalities at 15% by 2022 among the major industries such as construction, manufacturing and forestry industries. However, the rate of fatal accident cases in the construction industry recorded the highest percentage of 33.5% and followed by other industries from 2006-2019.

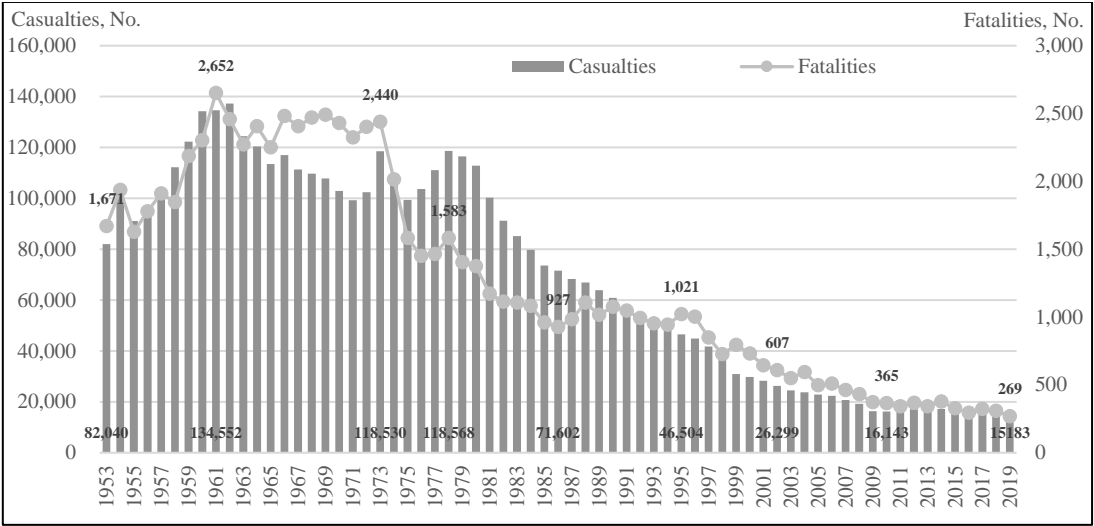


Figure 2.9: Construction related accidents and fatal accidents in Japanese construction industry (JISHA, 2020)

Construction Accident Overview between Japan and Malaysia

In view of the accident trends, Malaysia has not seen a noticeable decrease in the number of construction casualties and fatalities; while Japan experiences steadily downslope. The share of construction casualties and fatalities among all industries of both countries were compared to provide a clear model on how serious of the current fatalities in Malaysian construction industry. The ratio of casualties in the construction industry to all industries is about 3 to 4 times higher in Japan than in Malaysia; while the percentage of fatality accidents in the construction industry to all industries is approximately 30% to 50% in both countries (Figure 2.10). Yet, the construction fatalities in Malaysia fluctuates seriously from year to year. By comparing the ratio of fatalities to casualties, Malaysia holds 32% and Japan holds 1.7% in 2020 that indicates that Malaysia is more serious than Japan as these accidents are more likely to lead to fatal accidents. Japan recorded higher casualties in the construction industry than Malaysia, yet, Malaysia recorded the higher fatal percentage in construction accidents (Figure 2.10). The overview trend of the rate of

casualties and the rate of fatal accident cases in all industries between Japan and Malaysia are quite different. Overall, the trend of the construction related casualties and fatal cases in Japan are steadily decreasing over the past decades, but the Malaysian construction industry is undergoing the growth of construction casualties and fatal accidents. The safety and health performance between developed and developing countries showed the disparity of the accident rates between developing and developed countries is remarkable. The reported construction accident cases were lower in developing countries. In fact, the accuracy of the published construction accident data in Malaysia were not as accurate and detailed as compared to developed countries. The reported construction casualties in Malaysia were low compared to Japan in terms of number. In developing countries, the unreported accidents could be higher as more than 80 percent of foreign workers might work as illegal or expired work permits (Abdul Rahim et al., 2008); weak regulatory authority (Agwu, 2014) whereby self-reported the fatal accidents to the relevant authorities may lead to bad consequences to the project contractor (Oswald et al., 2020). To give a clearer picture of the construction accident curve between the two nations, the accidents reported in the relevant authorities are calculated as a percentage of all industries (Figure 2.10). The number of Malaysian construction accidents has increased about 80% from 181 cases in 2007 to a peak of 326 cases in 2019; and the construction fatalities remained the highest among all industries. In Japan, the number of construction accidents has decreased 49.6% or 29,747 cases in 2000 to 14,977 cases in 2020, while the number of fatality cases decreased 64.7% or 731 cases in 2000 to 258 cases in 2020. The trend of the construction related casualties and fatal cases in Japan have steadily declined but not been eliminated; on the other hand, the construction accident trends in Malaysia continues to show signs of high incidence. Table 2.6 shows the accident trends in Japan and Malaysia.

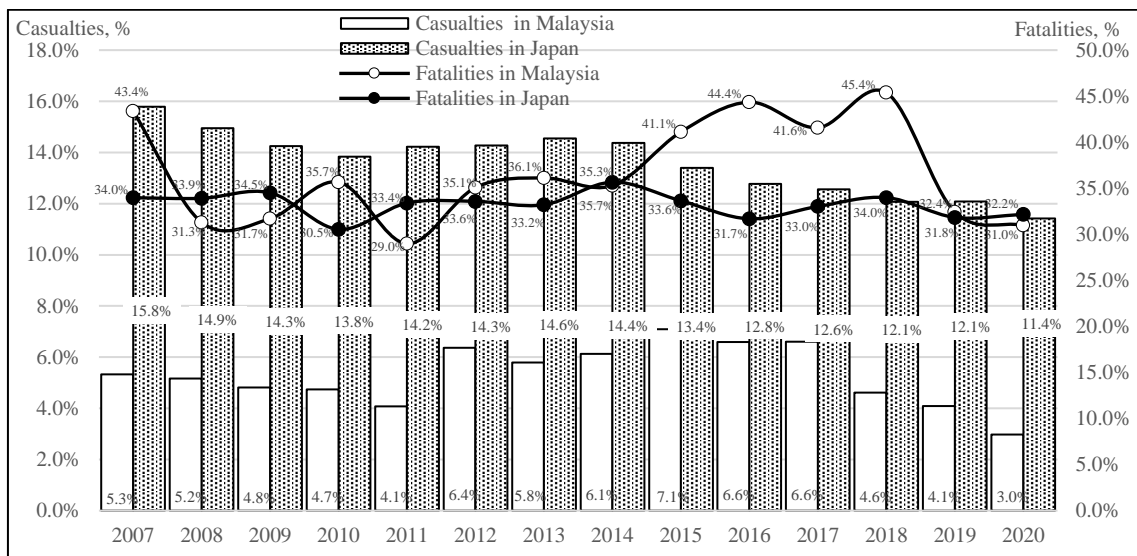


Figure 2.10: Comparison of the percentage of fatal accidents among casualties in construction industry between Japan and Malaysia (Sources: DOSH, 2020; JISHA, 2020) *(modified by the author)*

Table 2.6: Accident trends in Malaysia and Japan (2000-2020)

Year	Malaysia (DOSH)				Japan (JISHA)			
	All industries		Construction		All industries		Construction	
	Number of accidents	Number of fatalities	Number of accidents	Number of fatalities	Number of accidents	Number of fatalities	Number of accidents	Number of fatalities
2000	-	-	-	-	139,974	1,889	29,747	731
2001	-	-	-	-	140,149	1,790	28,284	644
2002	-	-	-	-	132,399	1,658	26,299	607
2003	-	-	-	-	132,936	1,628	24,543	548
2004	-	-	-	-	132,248	1,620	23,809	594
2005	-	-	-	-	133,050	1,514	22,869	497
2006	-	-	-	-	134,298	1,472	22,386	508
2007	3,395	219	181	95	131,478	1,357	20,764	461
2008	2,498	230	129	72	129,026	1,268	19,280	430
2009	2,386	224	115	71	114,152	1,075	16,268	371
2010	2,534	185	120	66	116,733	1,195	16,143	365
2011	2,429	176	99	51	117,958	1,024	16,773	342
2012	2,781	191	177	67	119,576	1,093	17,073	367
2013	2,832	191	164	69	118,127	1,030	17,189	342
2014	2,805	204	172	72	119,535	1,057	17,184	377
2015	3,345	214	237	88	116,311	972	15,584	327
2016	3,750	239	247	106	117,910	928	15,058	294
2017	3,635	267	240	111	120,460	978	15,129	323
2018	5,031	260	232	118	127,329	909	15,374	309
2019	7,984	259	326	84	125,611	845	15,183	269
2020	6,933	213	206	66	131,156	802	14,977	258

Notes:

- 1) The Japan Industrial Safety and Health Association (JISHA) OSH statistics in Japan organised and published the data collected by the Ministry of Health, Labour, and Welfare.
- 2) The OSH statistics in Malaysia published the data collected by the Department of Occupational Safety and Health (DOSH, 2020).
- 3) 2000-2006 data for all industries in Malaysia is not available by DOSH

2.3 Construction Accidents Types in Japan and Malaysia

The researchers noticed that the frequency of occupational accidents was inconsistent as early as in the 1970s (Mason, 1979), however, there were signs of daily patterns of accident occurrence in the workplaces. Interestingly, in recent years, researchers analysed the accident statistics and discovered that the fatal construction accidents could occur highly in summer months in China and the United States (Shao et al., 2019; KJT Lawgroup, 2023; The US Bureau of Labour Statistic, 2023). The frequency of fatal accident occurring time interval could be varying in different countries, for instance, more fatal accidents occur on Mondays, in the time interval of 10:00-11:00 and 15:00-16:00 in China; while a cross-sectional observational study of work-related injury in Ontario workers found out that the incidence of work-related injury is elevated in the evening and night (Mustard et al., 2013). To improve safety, understanding the antecedents to safety performance and outcomes is key (Doerr, 2020).

In Japan, for any occurrence of an accident at a construction site, it is an obligation to report it promptly to the related organisations corresponding to the contents of industrial accidents. It is obligated to inform the Labour Standards Inspection Office of such accidents as overturn of cranes, etc., collapse of buildings, failure of ground, explosion and fire, even if an industrial accident has not occurred.

In Malaysia construction sites, a contractor is fully responsible for accidents occurring at sites. Malaysia does have a clear penalty system against accidents, however, the penalties against the operators which caused accidents are often trivial fines that lead to unreported accidents.

By reviewing the accident types investigated by both countries, the Japanese government sorts out a detailed category and information about each reported accident. However, the investigated accident cases by DOSH remained low as compared to the number reported in Malaysia (shown in Table 2.6), which might be due to the different approaches to investigate the construction related accidents by DOSH. The overall reported accident cases remained low as compared to the number reported in developed countries, as this is a common issue faced by many developing countries of unreported accident cases.

Therefore, figuring out the construction accident types is strongly necessary for accident prevention (Shao et al., 2019). The investigation of fatal construction accidents was performed in both countries shown in Table 2.6 (DOSH, 2020; JISHA, 2020). The details of the investigation are similar except for “Others”. The classification of industrial accidents in Malaysia is indicated in the guidelines of Safety and Health, Notification of Accident, Dangerous Occurrence, Occupational Poisoning and Occupational Disease Regulation 2004 (DOSH, 2004).

Both countries recorded a high percentage of accidents for fall from height (44% in Malaysia, 44.2% in Japan) followed by struck, crushed and hit by (36.8% in Malaysia, 22.6% in Japan). Other accidents recorded in the Malaysian construction industry included inhaling poisonous gas, falling into rivers, stung by wasps, etc. Other accidents type found in Japan construction industry included cut/rub (31 cases, 0.6%), stepping through (8 cases, 0.1%), contact with hot and cold objects (149 cases, 2.8%), contact with harmful substances (76 cases, 1.4%), burst (7 cases, 0.1%), commuting to site (616 cases, 11.5%), and other unclassifiable (117 cases, 2.2%) such as vibration white fingers (VWF) or heatstroke were found in Japanese construction industry (Tamura and Tanaka, 2016). Table 2.7 shows the construction fatal accident types in Japan and Malaysia.

The highest workplace fatality numbers were reported on construction sites due to the nature of the industry which involves various types of high-risk activities on a daily basis. In developed and developing countries, fatal cases in the construction industry are the highest among other industries. Studies focusing on construction mortality data concluded that most frequent accidents were falling from height; struck, crushed or hit by falling objects or vehicles and falling from a moving platform (Swuste et al., 2012). Fall from height is one of the critical fatal construction accidents in developed countries such as China (Nadhim et al., 2016) and developing countries (Hoła and Szóstak, 2015; Evanoff et al., 2016; Umer et al., 2018; Abukhashabah et al., 2020) that bring impacts to humanitarian, economic and legal issues (Chong, 2014; Muhamad Zaini et al., 2020). In Japan, most of the fatal accidents occurred at the temporary and building structures, other devices or open edges without the fall-prevention system in high-rise building projects (Manzoor et al., 2021). The factors causing fall from height at construction sites included

working environment condition, organisational characteristics, workers' safety behaviours (Hu et al., 2011; Nadhim et al., 2016), supervision, education and training (Khosravi et al., 2014). There are ten (10) types of causes of fatal accidents in Malaysia construction industry investigated by Department of Occupational Safety and Health (DOSH) during 2010-2020, the highest percentage of 41.6% (or 89 cases) was recorded by lack of non-compliance work safe procedures, followed by 11.7% (or 25 cases) of lack of personal protective equipment (PPE) or shortage in provision; 9.3% (or 20 cases) of lack of supervision and training; 6% (or 13 cases) of unsafe working condition; 4.2% (or 9 cases) of floor opening not covered; 3.7% (or 8 cases) of failure in hazardous identification; 1.9% (or 4 cases) of unsafe of workers behaviours; 0.9% (or 2 cases) of no warning sign; 0.5% (or 1 case) of lack of edge protection and equipment failure. However, there are 17.8% (or 38 cases) of missing causes concluded by DOSH during this period. Studies showed that most of the construction fatal accidents were due to lack of Personal Protective Equipment (PPE), lack of supervision and training and lack of non-compliance work safe procedures (Bakar et al., 2008; Ayob et al., 2018; Ammad et al., 2021) (Table 2.8). Previous studies argued that the occurrence of construction accidents is considered as unsafe working conditions and behaviours which can be prevented by implementing safety and health guidelines strictly (Srinavin, 2007). The major causes of construction accidents are related to the unique nature of the industry (Bavafa et al., 2018). Unique characteristics distinguish the construction industry from other industries and contribute to a high accident rate at construction sites (Aminbakhsh et al., 2013). Characteristics such as dynamic work environments, extensive use of sophisticated plants, heavy equipment, and multiplicity of operations turned construction sites to a hazardous place. Construction accidents and injuries bring direct and indirect expenses. Direct expenses include medical costs and workers' compensation insurance, while indirect expenses contain delay in construction progress, worker's construction companies (Mahmoudi et al., 2014). Construction site safety is a complex phenomenon due to the decentralised nature of work processes, the involvement of a wide range of industries and many stakeholders, especially the construction workers who work in the construction sites on a daily basis. Therefore, statistical data analysis is essential to understand the accident trends in the construction industry, and in particular to assist the decision makers to obtain

appropriate programs that effectively address safety issues. In other words, it is important to get the right picture.

Table 2.7: Construction fatal accident types in Japan and Malaysia.

Construction industry fatal accidents				
	Malaysia (2010-2020)		Japan (2006-2020)	
Accident classification	cases	%	cases	%
Fall from height	92	43.0%	2,349	44.0%
Struck, crushed and hit by	79	36.9%	1,202	22.5%
Collapse, buried	19	8.9%	492	9.2%
Drowning	6	2.8%	120	2.2%
Electrocution	8	3.7%	102	1.9%
Burn	1	0.5%	58	1.1%
Explosion	1	0.5%	16	0.3%
Others	8	3.7%	1,004	18.8%
total	214	100.0%	5,343	100.0%

(Sources: DOSH, 2020; JISHA 2020)

Table 2.8: A total of 214 construction industry fatal cases reported and investigated by DOSH between 2010-2020

No	Causes investigated by DOSH types	Reported Cases										
		A	B	C	D	E	F	G	H	J	K	L
1	Fall from height	35, 39.33%	23, 92%	8, 40%	1, 25%	0	3, 23.08%	1, 20%	0	1, 100%	7, 77.78%	13, 34.21%
2	Struck-by	4, 4.49%	1, 4%	2, 10%	1, 25%	0	6, 46.15%	0	0	0	0	9, 23.68%
3	Crushed by	16, 17.98%	0	6, 30%	0	2, 25%	1, 7.69%	1, 20%	0	0	0	4, 10.53%
4	Hit by	13, 14.61%	0	2, 10%	1, 25%	4, 50%	0	2, 40%	0	0	0	4, 10.53%
5	Scaffolding collapsed	1, 1.12%	0	0	0	0	0	0	0	0	0	0
6	Drowning	0	1, 4%	2, 10%	0	0	0	0	2, 100%	0	0	1, 2.63%
7	Buried	8, 8.99%	0	0	0	0	2, 15.38%	0	0	0	0	1, 2.63%
8	Electrocution	3, 3.37%	0	0	1, 25%	2, 25%	0	0	0	0	0	2, 5.26%
9	Structure collapsed	5, 5.62%	0	0	0	0	0	0	0	0	0	2, 5.26%
10	Explosion	1, 1.12%	0	0	0	0	0	0	0	0	0	0
11	Bum	0	0	0	0	0	0	0	0	0	0	1, 2.63%
12	Others	3, 3.37%	0	0	0	0	1, 7.69%	1, 20%	0	0	2, 22.22%	1, 2.63%
total of 214 cases		89, 100%	25, 100%	20, 100%	4, 100%	8, 100%	13, 100%	5, 100%	2, 100%	1, 100%	9, 100%	38, 100%

“Others” accidents such as dead at the sewage treatment plant; died falling from lorry and truck; death in the elevator pit; died due to poisonous gas, insecticide poisoning and exposure of hazardous chemical; died fell into ravine and river; died falls into holes in the ground; died due to falling into oil reservoir.

Causes of fatal accidents investigated by DOSH Malaysia (reported cases between 2010-2020), A: Lack of non-compliance work safe procedures, B: Lack of PPE / shortage in provision, C: Lack of supervision and training, D: Unsafe of workers behaviour, E: Failure in hazardous identification, F: Unsafe working condition, G: Equipment failure, H: No warning sign, J: Lack of edge protection, K: Floor opening not covered, L: missing causes

2.4 Construction Workforce in Japan and Malaysia

Participation of Labour Force in Malaysia

Economic activities in Malaysia started to dependence on foreign labour in the early of 1970s and through the next decade to support national's economy rapid growth; the construction industry has been suffered from critical labour shortage since 1980s; with the high demand of labour from major industries, the formal guideline towards to the foreign labour were introduced in the early of 1990s. In the 1990s, the labour market was tight and the government started to encourage employment of foreign workers particularly from the Southeast Asia regions due to labour inadequacy (Zaleha et al., 2011). Since then, with the official policy allowing the permission of foreign labour to participate in major economic activities in Malaysia to meet the high demand of semi-skilled or unskilled labour in wide acceptance such as plantation, domestic services and construction industry; therefore, the number of foreign labours in Malaysia constantly increased until today. The immigration policy was initiated to allow a sufficient supply of unskilled and semi-skilled foreign workers into Malaysia to enhance the nation's economy growth.

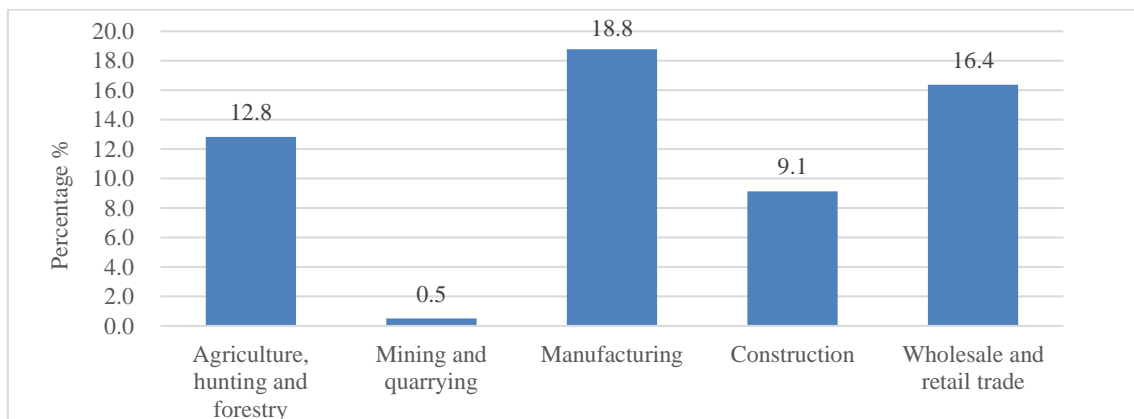


Figure 2.11: Percentage distribution of employed persons by industry (2001-2017)
Malaysia (Source: Department of Statistics Malaysia, 2020)

In view of economy activity in 2017, majority of the employees in Malaysia concentrated in four industries namely: services industry with 5,169 thousand persons which is approximately 53.7% of the total work force; followed by manufacturing and construction

industries recorded 2,215 thousand (23.0%) and 1,330 thousand (13.8%) persons respectively and 836 thousand persons in agriculture industry. All the industries show an increase of employment in the same year as compared to 2015. The average of the labour force in the construction industry holds approximately 9% of the total labour force that place at fourth after manufacturing industry (18.8%), wholesale and retail trade (16.4%), and agriculture industry (12.8%) over the past 17 years (Figure 2.12).

Labour force in Malaysia increased 2.0% to nearly 15.3 million workers and 15.6 million workers in 2018 and 2019 respectively as compared to 15.0 million workers in 2017. The increase in the labour force was contributed by 299,200 employed persons, and the labour force participation rate increased 68.7%. However, the unemployment rate remained at 3.3% in 2019. In Malaysia, the total labour force in the construction industry is approximately 9.1% among the rest of the industries (Figure 2.11).

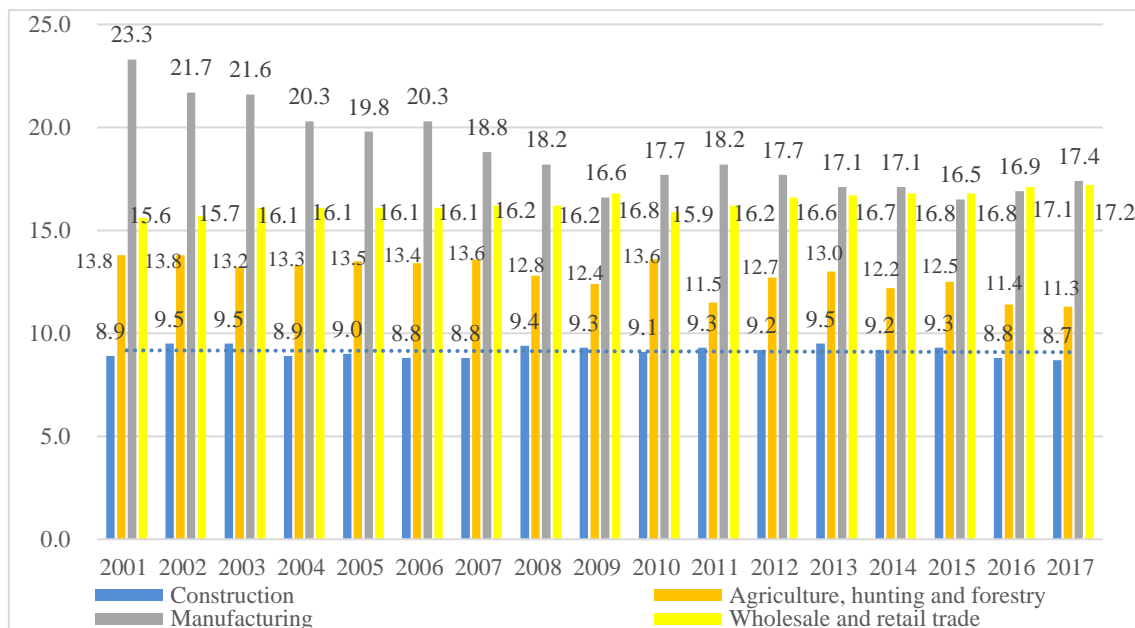


Figure 2.12: Percentage distribution of employed persons by industry (2001-2017)
Malaysia (Source: Department of Statistics Malaysia, 2020)

The numbers of employed persons in the manufacturing industry and agriculture and forestry industry gradually decreased from 2000 to 2017, this might be due to these industries starting to introduce the usage of machinery and advanced technologies to replace the current usage of manpower. Yet, the Malaysian construction industry is still

heavily dependent on foreign workforce, and the majority of the foreign workers come from the ASEAN region. The influx of foreign workers has elicited different issues towards social, political and economic issues in Malaysia. Although the 11th Malaysia Plan for economic agenda aims to create 1.5 million jobs by 2020 in order to improve productivity and tends to reduce the dependency on low-skilled foreign workers, yet, there are still approximately four million of foreign workers in both legal and illegal sectors. According to Bank Negara Malaysia annual report (2014), there were around two million registered foreign workers in Malaysia, and according to a past statement by the Immigration Department, the illegal foreign workers were estimated to be over two million in Malaysia.

Participation of Labour Force in Japan

In Japan, the average rate of labour participation in manufacturing and wholesale and retail trade between 2012-2019 shared 17.4% and 16.9% respectively, which placed them at the top two industries with higher number of labour participation between the period. Construction industry remained constant with approximately 7% of labour participation rate among all industries; while the least employment participation is agriculture and forestry industry share approximately 1%. By looking into the detailed distribution of employed persons by industry in Japan, the overall trend of the employed person for four industries decreased from 1953 to 2019. For instance, the agriculture, fisheries and forestry industry held 39.8% of employed persons in 1953 decreased drastically to 10.4% in 1980s, 7.2% in 1990s, and 3.3% in 2019. This trend might be due to the economic transformation towards advanced technology. The construction industry holds 5.9% in 1953, increased gradually to 7.3% in 1960s, 8.8% in 1970s, hit the highest percentage of 10.1% in 1980s, then continuously decreased to 9.5% in 1990s, slightly increased of 0.4% to 9.9% in 2000s, 8.1% in 2010s, and 7.5% in 2019 (Figure 2.13).

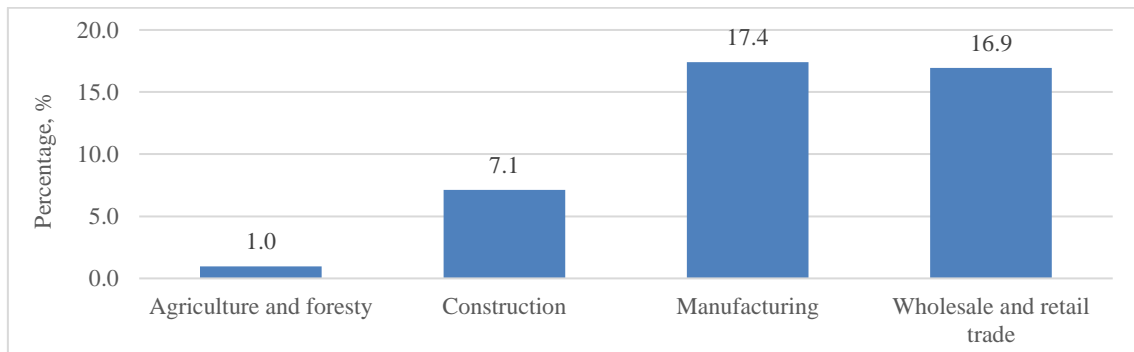


Figure 2.13: Distribution rate of employed person by industries, (2012-2019) Japan
(Source: Statistic Bureau of Japan, 2020)

From the labour participation rate distribution trend, the number of labourers participating in manufacturing, wholesale and retail trade has gradually decreased. For instance, the distribution of employed person involved in manufacturing shared 18.4% in 1953 increased to 23.4% in 1960s, 27% in 1970s, decreased to 24.7% and 24.1% in 1980s and 1990s respectively, 20% in 2000s, 16.8% in 2010 and 15.8% in 2019; in wholesale and retail trade which shared 17% in 1953, continuously increased to 19.7% in 1960s, 20.5% in 1970s, 22.5% and 22.6% in 1980s and 1990s, 23% in 2000s and gradually decreased to 16.9% and 15.7% in 2010 and 2019 respectively (Figure 2.14).

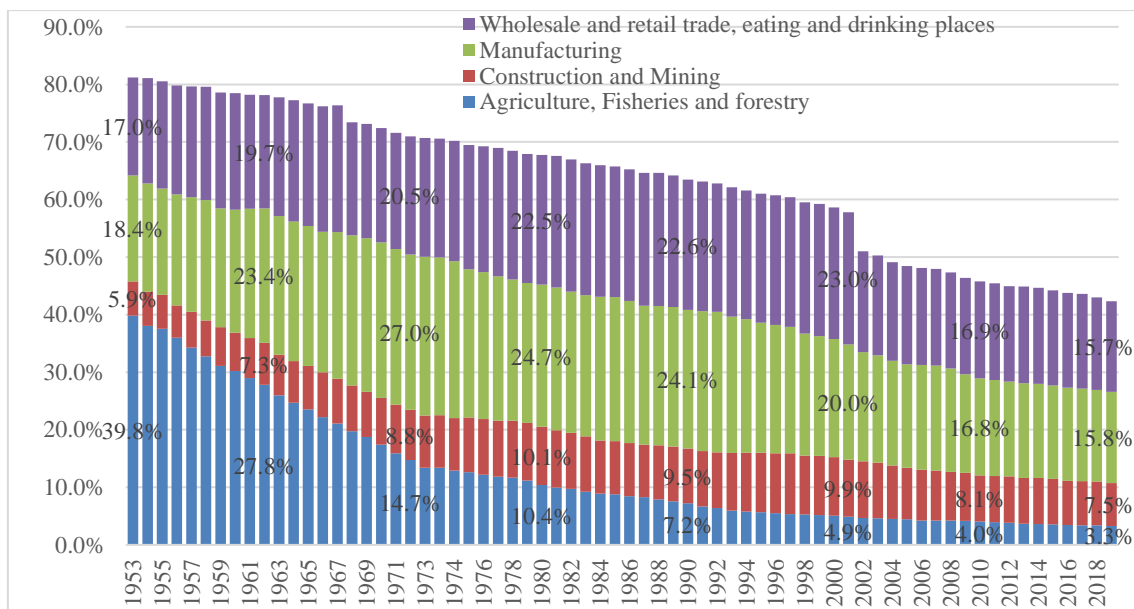


Figure 2.14: Distribution rate of employed person by industries, (1953-2019) Japan
(Source: Statistic Bureau of Japan, 2020)

The labour workforce involved in the manufacturing industry between Malaysia and Japan gradually decreased over the years; while by comparing the employed persons involved in industries between Malaysia and Japan, the number of labour workforce involved in the construction industry in Malaysia from 2002 until 2017 is similar to the situation back to 1970s in Japan. In other words, Malaysia's construction industry workforce is 30 years behind Japan's. The current workforce involved in the Japanese construction industry is reduced to 7.1% or less, due to the involvement of machinery and advanced technologies to replace the current usage of manpower and overcome the ageing of population issues.

Labour Force Distribution by Age Group in Japan and Malaysia

In Malaysia, the average percentage of labour force by age and gender for all industries between 2001-2017 shown in Figure 2.15. From the trend of the distribution rate of labour force, the labour force by age employed in construction industry is mainly between the age group of 25-29 years old (96.2% of male labour, 67.7% of female labour), following by the age group of 30-34 years old (97.8% of male labour, 63.5% of female labour), and the third place falls on 35-39 years old (98.2% of male labour, 58.8% of female labour).

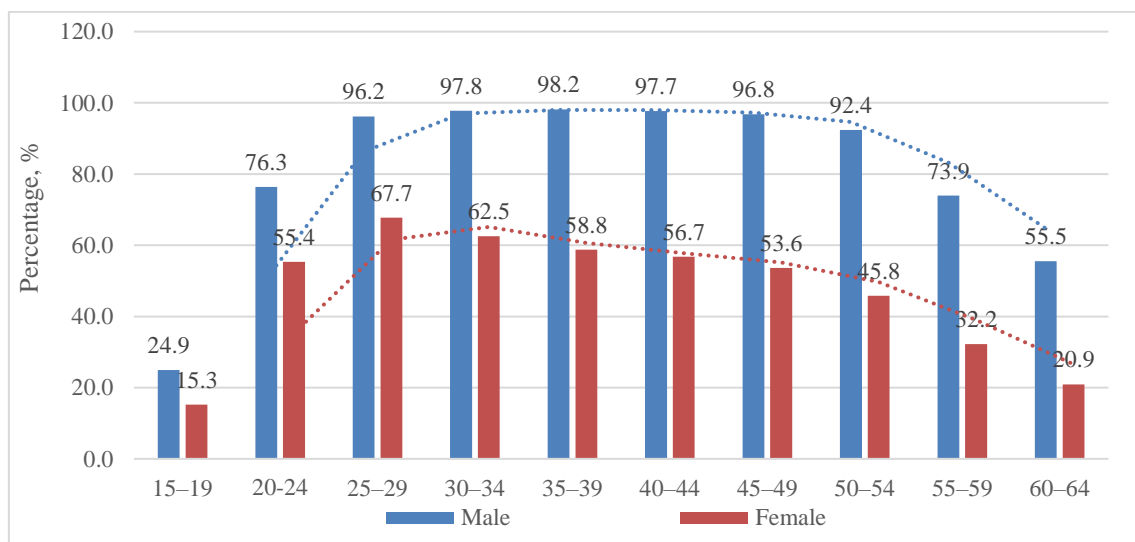


Figure 2.15: Labour force by gender and age group for all industry (2001-2017)
Malaysia (Source: Department of Statistics Malaysia, 2020)

In 2017, male workers were 6.6 million persons which accounted for approximately 68.3% of the overall employment in Malaysia. In 2019, 22.7 million workforces are working age (defined by Department of Statistics Malaysia (DOSM) as individual aged between 15 to 64 years old), and 15.6 million people are in the labour force with 9.5 million of male and 6.1 million of female; while 7.1 million people are outside of the labour force (Male: 2.3 million; Female: 4.8 million) for various reasons such as schooling, family responsibilities, disability and retirement.

Considering the age groups of youth (15-24 years old) and adults (25-64 years old) it is evident that young people consistently have a higher proportion than adults working 40 hours a week. In 2016, this proportion was 85% youth and 83.5% adults, compared with 80.1% of youth to 72% of adults in the 1990s. The gap did not really go narrow until after 2010. Several factors may count for this such as young people may have to work longer hours to earn a decent income than adults due to their wage levels are considerably lower; the type of jobs available require longer hours and are amenable for younger people who are stronger, more nimble and with fewer other family obligations, for example manual jobs in construction, agriculture and certain labour-intensive manufacturing, as well as younger people are more susceptible to being exploited and forced to work longer hours.

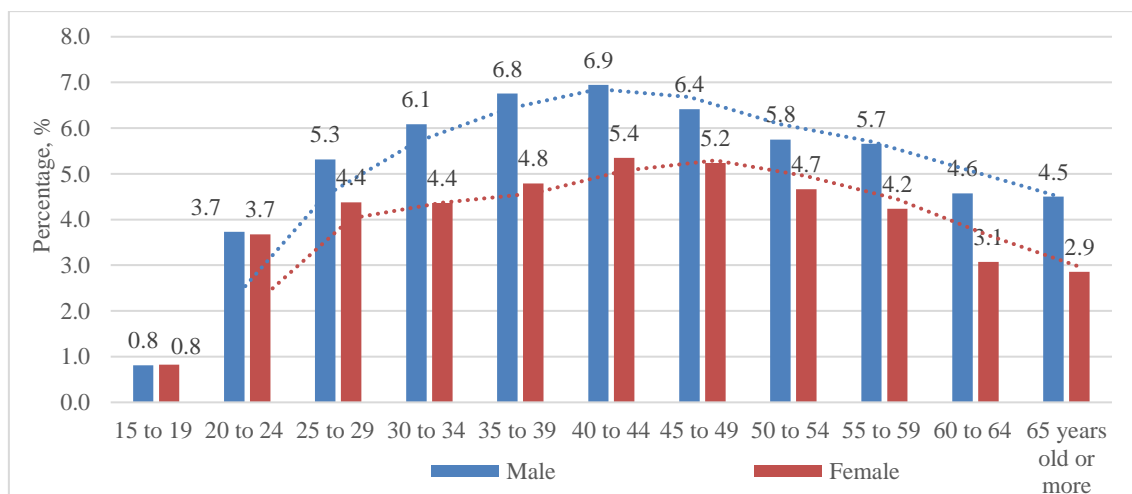


Figure 2.16: Distribution rate of labour force by age and gender for all industries (2007-2019), Japan (Source: Statistic Bureau of Japan, 2020)

In Japan, the average percentage of labour force by age and gender for all industries between 2007-2019 shown in Figure 2.16. From the trend of the distribution rate of labour

force, the labour force by age employed in construction industry is mainly between 40 to 44 years old (6.9% for male labour, 5.4% for female labour), following by 35 to 39 years old (6.8% for male labour, 4.8% of female labour), and 45 to 49 years old (6.4% for male labour, 5.2% of female labour). However, in Malaysia, the labour force by age in industry is between 25 to 34 years old. The younger age involved in the labour force in Malaysia is obviously spotted from the statistics.

In Japanese construction industry, the total employed person is approximately 7.3% among all industry, and the majority of the construction labour is between the age group of 35 to 44 years old (0.9%), followed by the age group of 45 to 59 years old (0.8%), and 60 and above (0.7%). The minority contributed by the age group of 25 to 29 years old (0.5%), 20 to 24 years old (0.4%), and 0.1% of the age group of 15 to 19 years old. The ageing population in Japan has led to the issues where the percentage of involvement of elderly is higher than the young age workforce. Figure 2.17 showed the age group labour force in all industries and construction industry in Japan between 2007-2019 as the age group by industry for 1953-2006 is not available. Unfortunately, the labour force age group by industry is not available in Malaysian context.

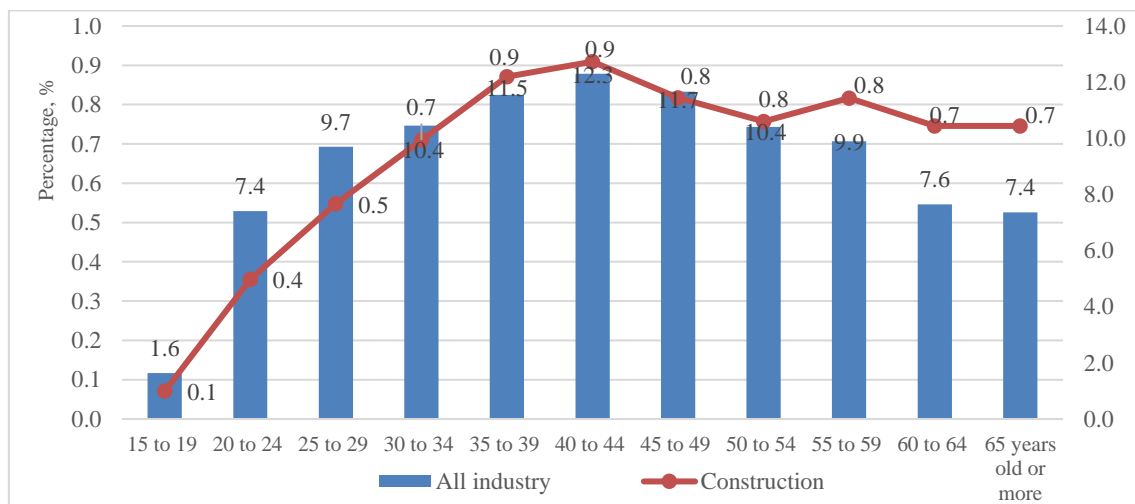


Figure 2.17: Distribution rate of labour force by age group in construction industry (2007-2019), Japan (Source: Statistic Bureau of Japan, 2020)

Labour Force Distribution by Gender in Japan and Malaysia

The percentage distribution of employed persons by gender in the manufacturing industry was higher than the rest of the industries, and the gender ratio distribution is less than 2%. Based on the average distribution by gender of employment by industry from 2001 to 2017, 20.1% of female labour force found in the manufacturing industry compared to 18% of employed men; while the distribution of labour by gender for wholesale and retail trade holds 16.4% and 16.3% respectively for male and female. This tendency reflects the increasing participation rate of females in the workforce as the trend may also be consistent with the evidence that females in Malaysia are becoming better educated relative to men, as a larger number of females than male graduate each year from tertiary education institutions.

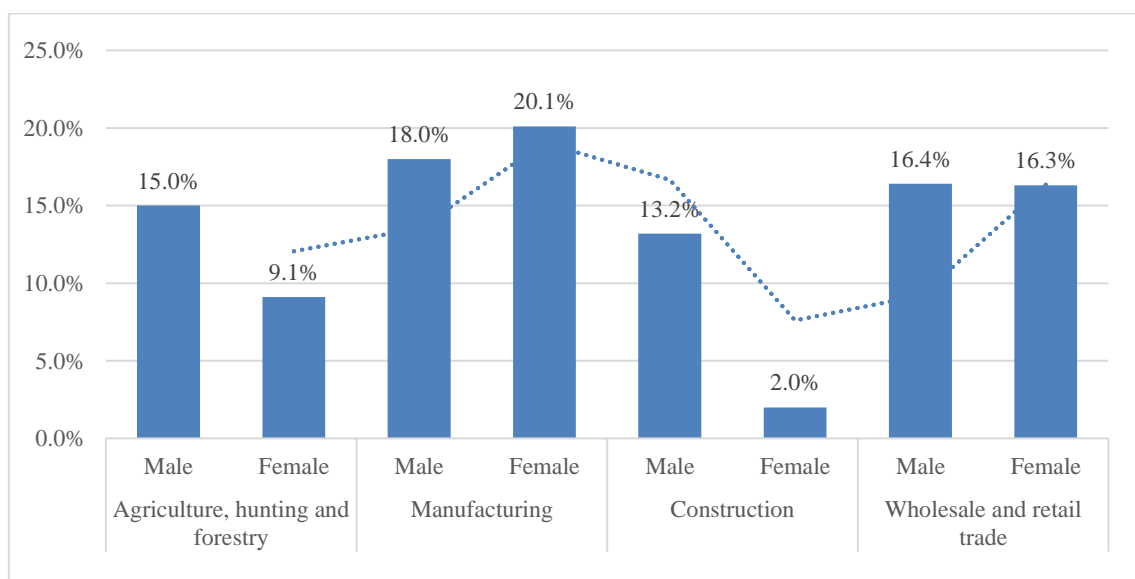


Figure 2.18: Percentage of employed persons (average) in gender by industries, Malaysia, 2001-2017

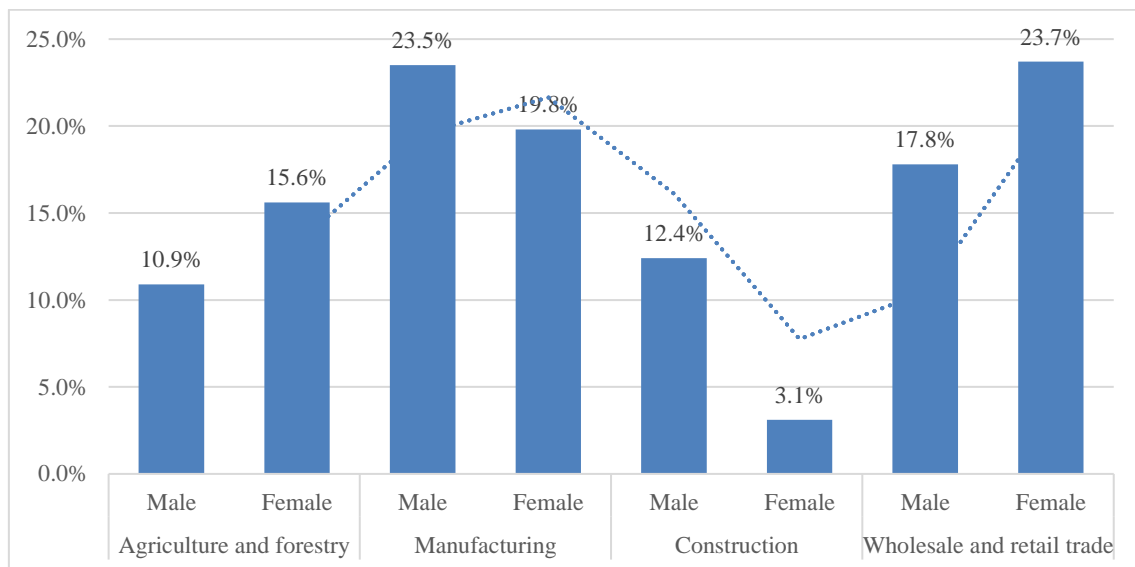


Figure 2.19: Percentage of employed persons (average) in gender by industries, Japan, 1953-2019

Amongst these four major industries in Malaysia, the highest difference of the distribution between male and female workers falls in the construction industry. On an average for the past 17 years, 13% of male workers and 2% of female workers were involved in the construction industry. In Japan, the highest difference of the distribution between gender workers is manufacturing industry with 22% of male labour and 11.6% of female labour, while the second highest is construction industry with 10.7% of male labour and 2.7% of female labour. From the above distribution, the gender diversity in the construction industry is poor as it is still male dominated in both nations (Figure 2.18 and Figure 2.19).

Wages Distribution among Industries in Malaysia and Japan

In 2017, on average, workers earned monthly salaries and wages of RM 2,804 (Ringgit Malaysia) with a growth of 4% annually as compared with 2015 (RM 2,594). Meanwhile, the workers in the construction industry earned average monthly salaries and wages of RM 2,499 which is below the average. The income inequality has declined since the 1970s, according to the *Khazanah* Research Institute's (KRI) State of Household report (2018) stating that household income in Malaysia has steadily increased from 1970 to 2016. In 1970, household median income was RM819 in 2016 prices and today, this

figure has increased 6.4 times to RM5,228. The salaries and wages in the construction industry are below the average salaries among all industries in Malaysian context (Figure 2.20).

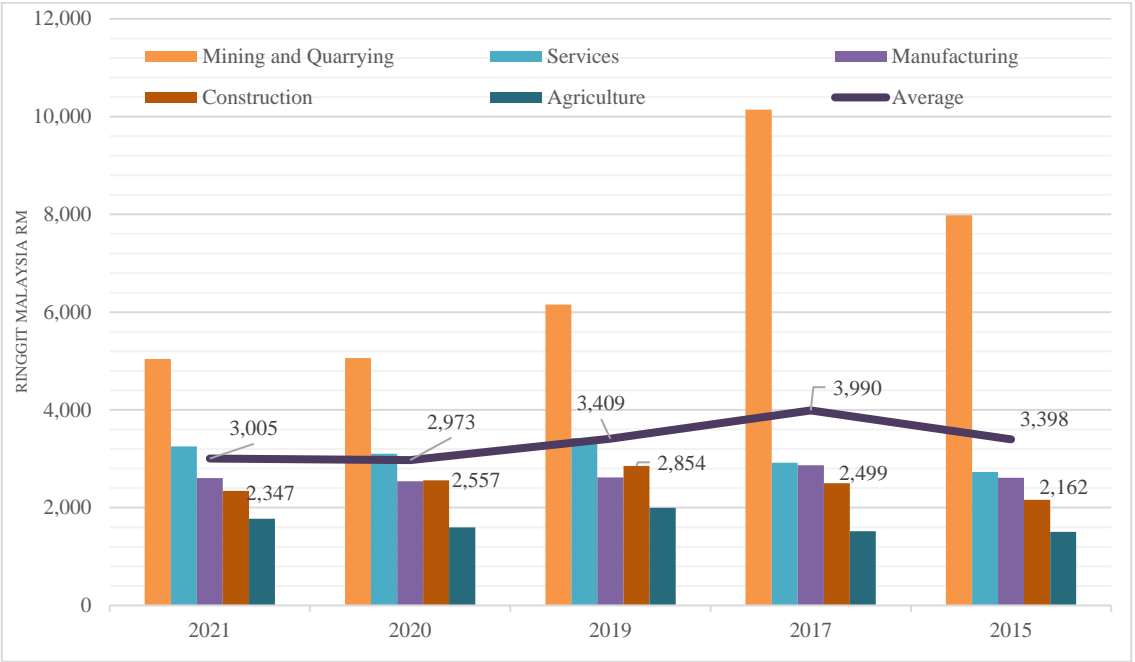


Figure 2.20: Average monthly salaries and wages (Ringgit Malaysia, RM) by economic activities (2015-2020) Malaysia (Source: Department of Statistics Malaysia, 2020)

The monthly salaries distribution by economic activities in Japan from 2010 to 2019 show the above. The wages in the construction industry held slightly higher than the mining, quarrying gravel pitting industry with 331,300 thousand yen in 2010; increased approximately 10% to 364,700 thousand yen in 2019. The average wage distribution among all the industries is between 323,000 to 338,000 thousand yen. Overall, the wages distribution among all the economic activities in Japan are a little different (Figure 2.21).

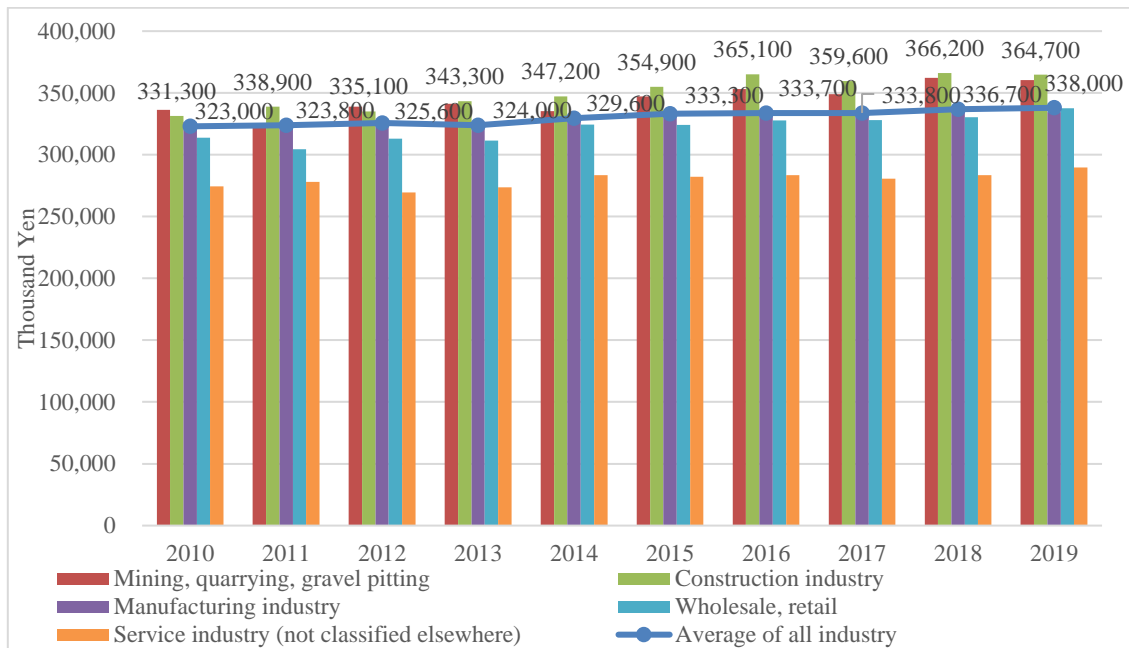


Figure 2.21: Monthly salaries by economic activities (2010-2019) Japan

Wages and Salaries in Construction Industry

The wages and salaries are higher in the industry that is growing faster. However, the Malaysian construction workers earned average monthly salaries and wages (RM 2,854 Ringgit Malaysia) in 2019 which is below the average (RM 3,224) of the whole industry that placed second lowest after the agriculture industry over the years. The average salaries earned by the construction workers is considered as underpaid and this is running the opposite direction to become a high-income developing country. The current Malaysian construction industry is restricted by the low-wage and low efficiency due to the extensive dependence on low-skilled or unskilled foreign workers (Mohd Najib et al., 2019). The Figure 2.22 showed the mean monthly salary and wages by citizenship. The non-citizen refers to the foreign workforce who works in Malaysia. Overall, the monthly salaries received by the non-citizen is much lower than Malaysians in all industries.

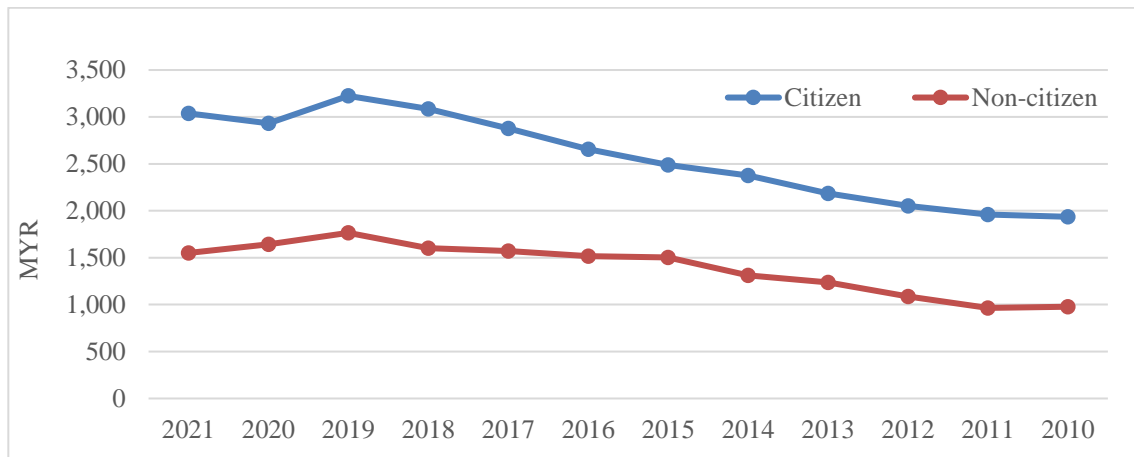


Figure 2 22: Mean Monthly salaries and wages by citizenship (2010-2021) Malaysia
(Source: Department of Statistics of Malaysia, 2022)

On the contrary, in Japan, the earned average monthly salaries and wages by the construction workers is the highest compared to the rest of the industries and steadily increased (331,300-364,700 Japanese Yen) in 2010-2019. In Japan, the distribution of scheduled salary in the construction industry is shown below. The age group of 50-54 years old hold the highest scheduled salary (412.2 thousand yen) in the construction industry; followed by the age group of 55-59 years' old (407.5 thousand yen) and 45-49 years old (381.7 thousand yen). The lowest scheduled salary was recorded by the age group of below 19 years old (187.1 thousand yen), and the age group of 20-24 years old (219.9 thousand yens) (Figure 2.23).

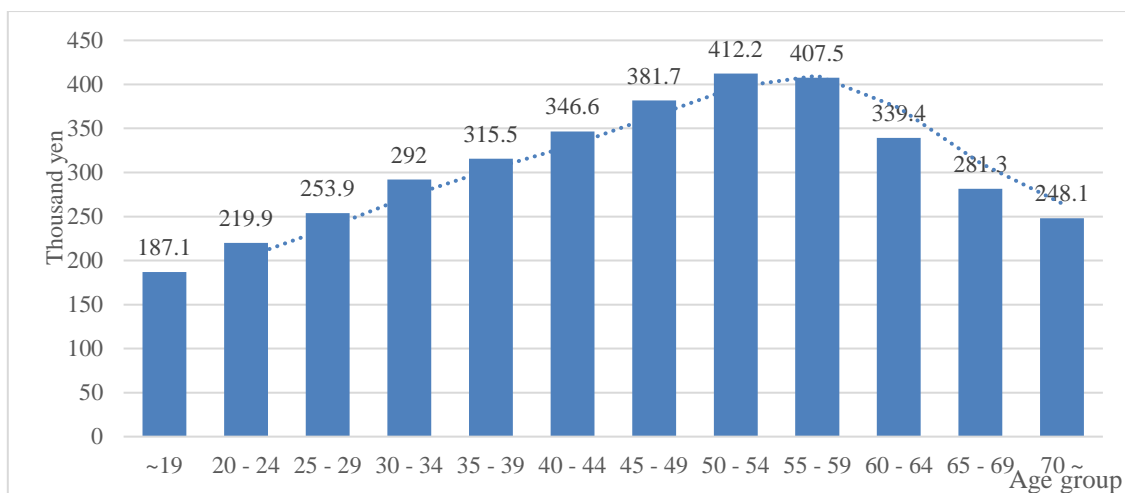


Figure 2.23: Scheduled salary (average) in construction industry (2009-2019) Japan

The construction sector is expected to expand and play a significant role in creating more employment opportunities for skilled and unskilled workers; meanwhile, Malaysia has heavily depended on the use of foreign workers either legally or illegally in the construction sector. There are always pros and cons, the expansion of the construction industry has created various employment opportunities to foreign workers and boosted the nation's economy, yet it also created various problems. For instance, low-wages received by the workforce in the Malaysian construction industry regardless of citizenship, yet, the non-citizen received even lower wages in the industry; most of the foreign workers did not undergo any skills training programme after arriving in Malaysia which increased the risks of low quality and productivity in the construction industry.

Foreign Workers in Construction Industry in Japan

In general, the term “migrant workers” or “foreign workers” refers to those who travel to another country looking for a job and do not own citizenship in the country of employment. According to the migration for employment convention under the International Labour Organisation (ILO, 1949), the “migrant for employment” means a person who migrates from one country to another with a view to being employed otherwise than on his or her own account (Article 11(1) of the Migration for Employment Convention). Countries such as the United Kingdom, Australia and Singapore refer to these people as migrants, while countries such as the United States, Japan and Malaysia refer to these people as foreign workers. In Japan, the definition of foreign workers* (referred to as “technical intern trainees”) also includes those who engage in activities to acquire more practical techniques and skills under employment relationships with the status of residence of “specified activities” under the technical internship system. The term “technical intern trainees” as used in the Technical Intern Training Act (TITA) refers to two types of technical intern under individual-enterprise and supervising-organisation. The definitions of both types of technical intern trainees are comprehensive stated in the Act. The foreign workers who have been accepted by the Japanese public or private organisation or supervising-organisation as technical trainees are mandatory to attend necessary lectures and engage in work which requires the skills.

* Guidelines for business owners to appropriately deal with improvement in employment management of foreign workers (Ministry of Health, Labour and Welfare (MHLW)).

According to the report Triangle in SEAN quarterly briefing note done by ILO (2023), Malaysia is dependent on foreign workforce who are coming from neighbour countries namely Indonesia (690,659 migrants in 2019), Myanmar (140,461 migrants in 2019), Vietnam (17,327 migrants in 2019), Philippines (51,837 migrants in 2019), Thailand (14,928 migrants in 2019), and Cambodia (3,321 migrants in 2019). These foreign workers are employed on a temporary basis to fill the gaps of shortages (Syed Jamalulil et al., 2022). However, the existence of illegal foreign workers tends to draw the attention of the government and the stakeholders. The number of foreign workers is expected to be even larger of the undocumented foreign workers, equal or exceed the number of registered foreign workers in Malaysia (Surendran, 2021). Based on the World Bank report (2020), the total number of foreign workers estimated at 1.23 million to 1.46 million (out of an estimated number of 2.96 million to 3.26 million foreign workers in 2017) were estimated as illegal foreign workers (The World Bank, 2020). The deputy director of Immigration Department of Malaysia stated that a total of 96,809 undocumented immigrants have been deported in 2021 under the Repatriation Recalibration Programme (TheStar, 2021). However, The Ministry Labour Recalibration Programme has received 212,926 applications from illegal immigrants who are mainly for the construction industry, where 122,075 application which enables the foreign workers to be legalised in the construction sector, said by Home Minister Datuk Seri Hamzah Zainuddin in 2021 (Jalil, 2021). In Malaysia, around 60-90% of the building works were carried out by foreign workers, and about half a million of these foreign workers were without a working permit or visa (Lingard, 2013). In other words, there is no way to measure the actual number of undocumented foreign workers who work in the Malaysian construction industry. Unfortunately, the growth of illegal immigrants has become a major issue and it seems to be out of control.

Foreign Labour Workforce in Malaysia and Japan

Construction Foreign Workers in Malaysia

Malaysian construction industry employs about 9% of the country total employment (Department of Statistics Malaysia, 2020) past two decades and about 70% of construction labours are occupied by foreigners mainly from Indonesia and Bangladesh legal and illegal (Abdul-Rahman et al., 2012; Ismail and Yuliyusman, 2014). Malaysia relies heavily on foreign labourers, especially in the construction industry that not many residents opt to work in these industries due to low-wages, long working hours and danger (Williams, 2017). The specific skill training programme or qualification to work at specific industry for the foreign workers are not reflected in the recruitment terms and conditions in the Immigration Department of Malaysia (2021). The foreign workers did not receive any training after arriving in Malaysia that would lead to negative impacts in terms of safety, productivity and quality assurance in the construction industry (Abdul-Rahman et al., 2012). Malaysians need these foreign workers in the construction industry, but do not recognize them as wanted (Dannecker, 2005). The presence of foreign workers is the most critical concern facing the Malaysian construction industry as the poor quality of unskilled foreign workers is the weakness in exchange for a cheaper workforce (Hamid et al., 2011; Ismail et al., 2018).

Foreign labour with differences of mother tongues, background, and life habits when working overseas, lack of training, knowledge, awareness as well as the employers' negligence regarding safety and health often cause occupational casualties (Cheng and Wu, 2013). Malaysia as a developing nation, in the construction industry labour intensive is always a major issue in terms of occupational safety and health, labour welfare, laws and regulation and insurance policy. According to the Ministry of Human Resource 2018, 36% of foreign workers employed are engaged in the construction industry (World Bank, 2019). With the involvement of legal or illegal foreign workers who come from ASEAN region in construction industry (Abdul-Rahman et al., 2012), were not undergone any education or skills training programme beforehand which directly growth the risks of low quality and productivity; and stimulate various social issues politically and economically (Ismail and Yuliyusman, 2014; Mohd Najib et al., 2019). Due to the availability of foreign

workforce, especially unskilled workers are willing to work in the construction industry even for low-wages. For instance, the safety of emergency evacuation awareness is difficult to be well understood by the low level of education and large number of general workers (Norafneeza and Hanidi, 2019).

In Japan, the construction industry employs about 7% of the country's total employment (Statistics Bureau of Japan, 2020) while the foreign construction workers' ratio held 0.23% in 2008 and increased to 3.48% in 2019. Majority of the foreign labourers who participated in the Japanese construction industry are from Vietnam, China and the Philippines. The overall number of foreign workforces in the construction industry has steadily increased, for instance, the number of labourers from Vietnam is increasing from 30.6% in 2015 to 50.2% in 2019. Malaysia is similar to Japan as many foreign workers are employed in the construction industry due to shortage of field workers and other issues. To this end, Japan established a system and structure for foreign technical trainees that show the strong link between the construction industry in Japan and Southeast Asia.

Japan is expanding its technical education system to ensure that overseas workers will want to work in Japan in the future.

According to the Japanese Industrial Safety and Health Act (1972) (under the Article 19-2) the employer must provide education and training to the employees to enhance the ability to improve the safety and health in the workplace; and the foreign workforce must go through a series of training before and after landing to Japan construction sites. This can reduce the possible construction accidents, especially the unsafe working behaviours on site (Oswald et al., 2015). Similarity in Japan and Malaysia, the main contractor always takes the responsibilities such as insurance and compensation for accidents occurring on site even if the accidents were due to the carelessness of a sub-contractors (Hino et al., 2011). Contractors in the developed countries consider effective safety training as a company strategy for better safety outcomes (Demirkesen and Arditi, 2015). The development of a pool of trained workers in appropriate site management would lead to effectiveness on site (Ofori et al., 2013).

Economic activities in Malaysia started to depend on foreign labour in the early 1970s however, the formal guidelines towards the foreign labour were introduced in the early 1990s. Since then, with the official policy allowing the permission of foreign labour to

participate in major economic activities in Malaysia to meet the high demand of semi-skilled or unskilled labour in wide acceptance such as plantation, domestic services and construction industry; therefore, the number of foreign labours in Malaysia constantly increased until today. The immigration policy was initiated to allow a sufficient supply of unskilled and semi-skilled foreign workers into Malaysia to enhance the nation's economy growth.

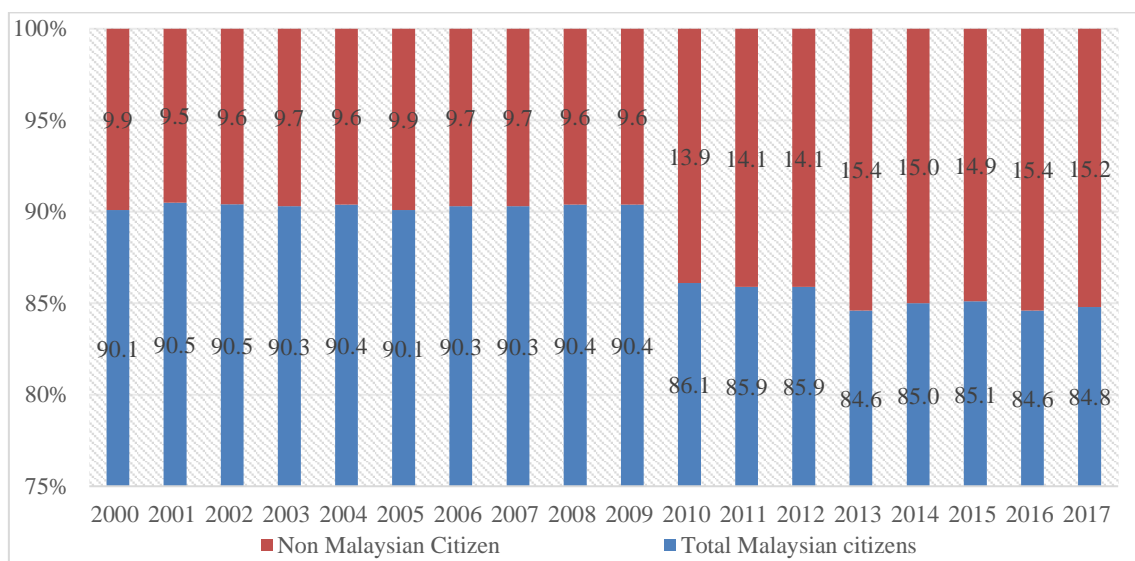


Figure 2.24: Percentage distribution of labour force between Malaysian and Non-Malaysian in Malaysia (2000-2017) (Sources: Department of Statistics Malaysia)

Transformation of the country's economic structure from agricultural to manufacturing and services has impacted changes to the labour requirements, especially developing countries heavily dependent on the needs of foreign workers (Figure 2.24). Many Malaysians are not willing and not interested to join into the working condition with rough nature of work in construction site that require more physical strength compared to working in better condition such as air-conditioned office, and they believe with a better and higher qualification will be offering better job and better salary in order to raise the standards of living.

This is good news where the overall Malaysia's education level will be improved towards the direction of developed countries; the bad news is Malaysia requires a high rate of workforce into various industries, it means Malaysia needs more foreign workers to fill

up the labour market vacancies, especially the 3Ds industry. The growing presence of foreign workers in Malaysia can be explained by excess demand for labour associated with rapid economic growth and of course the relatively cheaper cost of foreign labour. Based on a valid estimation indicated by the Ministry of Human Resources, there are over two million registered migrant workers or legal foreign workers; and Malaysian Employer Federation (MEF) proposed an estimate of at least another six million unregistered illegal foreign workers in Malaysia (Ismail and Yuliyusman, 2014).

The Malaysian government was lifting the freeze on hiring foreign workers for four industries which are facing a major shortage of workers namely manufacturing, construction, plantation and furniture-making industries. Ministry of Home Affairs statistics on the number of foreign workers by country of origin (2000-2015) identified at least eight (8) countries as the major source for foreign workers in Malaysia. The main contributing countries are Indonesia, Bangladesh, Thailand, Philippines, Pakistan, Myanmar, Nepal, and India. Based on the trend patterns, Indonesia, Bangladesh, Nepal and Myanmar can be considered as the major active contributors for Malaysia's foreign labour workforces. The non-Malaysian has a growth of 4.3% between 2009 and 2010 where Malaysia' economy has slowly recovered from 2009, this is the reason why the number of non-Malaysia citizen labour force increased from 9.6% to 13.9% between 2009 to 2010 and hit 14.1% in 2011 and 2012; and remain increased approximately 1.3% to 15.2% in 2017. The Malaysia economy has recovered with the change of Prime Minister which increased of foreign labour workforce in 2009 to 2010.

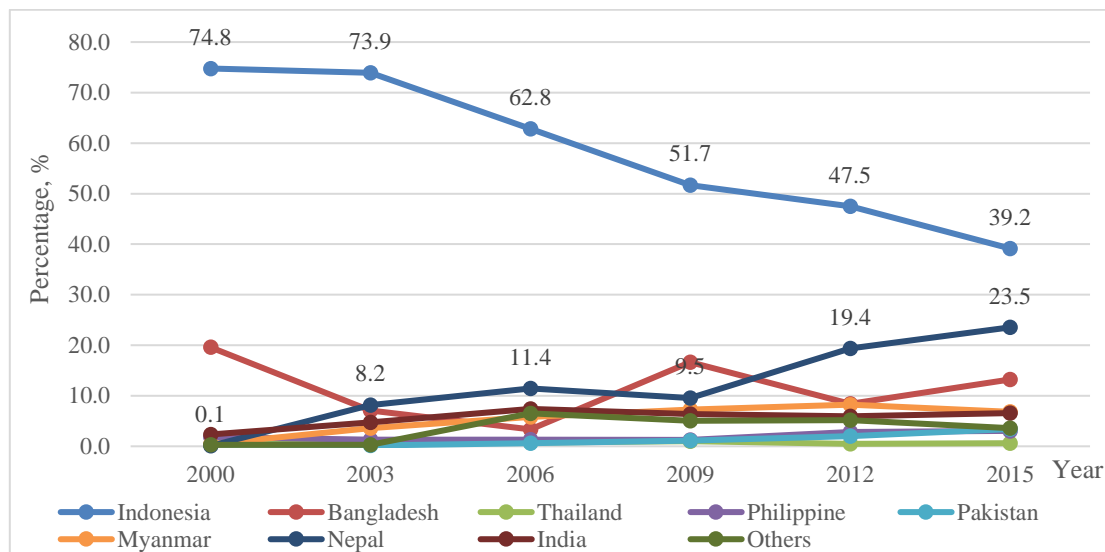


Figure 2.25: Percentage (shared) of registered foreign labour workforce in all industries (2000-2015) Malaysia (Sources: Department of Statistics Malaysia) (Modified by author)

Amongst these countries, Indonesia places at top with approximately 74.8% (more than 600,000 numbers) since 2000 and gradually decreased to 39.2% share (more than 835,000 numbers) in 2015 in supplying foreign workers to Malaysia (Figure 2.25). In 2015, the nationality of Nepal increased to 23.5% of share (more than 500,000 numbers) from 0.1% (more than 600 numbers) in 2000. Over the 15 years, an average of percentage of registered foreign workers in Malaysia descending as Indonesia (56.8%), Nepal (12.4%), Bangladesh (11.5%), Myanmar (5.7%), India (5.5%), Philippine (2%), Pakistan (1.2%), Thailand (0.7%), and others (4.2%).

The number of foreign workers in Malaysia has grown rapidly over the past two decades. According to the Labour Force Survey, Department of Statistics Malaysia, there were approximately 380,000 foreign workers in Malaysia back in 1990s; and the numbers of foreign workers in Malaysia drastically increased to around 2.1 million of registered foreign workers. It has been stipulated under the 11th Malaysia Plan that the ratio of foreigners in the country's labour market must not exceed 15 percent, or 2.1 million. Yet, with the influx of undocumented foreign workers, the ratio would have reached an astonishing 43 percent, which is almost three times more than what the labour market requires. It is difficult to accurately measure the exact numbers since the data are nearly

impossible to reach. On the other hand, there are no official actual numbers of foreign workers involved in the construction industry.

The overall percentage of registered foreign workers in Malaysia gradually decreased every year since 2000. The number of foreign workers from Indonesia and Philippines has dropped as these foreign workers decide to seek jobs somewhere else than Malaysia due to the drop of Malaysia Ringgit, increasing levy and their certainty better employment opportunities and remuneration prospect accessible elsewhere which resulted in unwillingness to continue their employment in Malaysia. On the other hand, Malaysia is no longer attractive as an employment destination for these foreign workers. According to the Ministry of Home Affairs, the current approved sectors for foreign workers' intake application and levy payment rates for each sector are as below:

Table 2.9: Levy payment rates for each sector in Malaysia

Sector	Levy (Peninsular) (RM)	Levy (Sabah/Sarawak) (RM)	VPTE (RM)	Process (RM)	Visa
Agriculture	640.00	410.00	60.00	125.00	Based on nationality
Construction	1,850.00	1,010.00	60.00	125.00	
Manufacturing	1,850.00	1,010.00	60.00	125.00	
Plantation	640.00	590.00	60.00	125.00	
Services	1,850.00	1,490.00	60.00	125.00	
Services (island resort)	1,850.00	1,010.00	60.00	125.00	

*Rate of levy, VPTE and process fee based on different sectors (Source: Ministry of Home Affairs)

In Japan, the overall ratio of the foreign labour in industries is shown in Figure 2.26. Overall, the manufacturing industry shared the most foreign labour from 1.67% in 2008 to 4.55% in 2019; while the noticeable increase in the construction industry with 0.23% in 2008 increased to 3.48% in 2019.

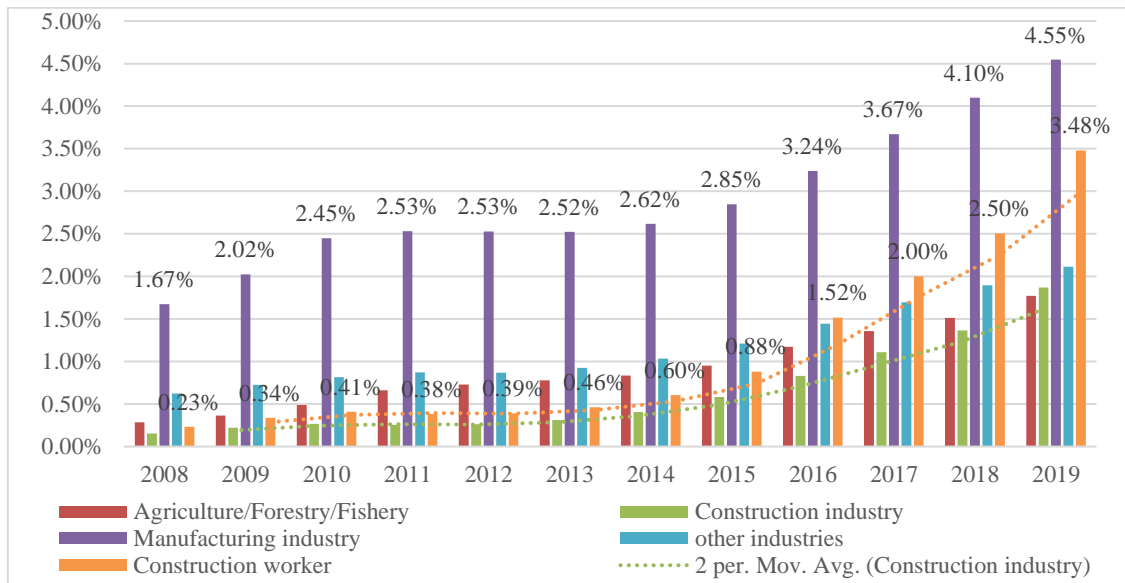


Figure 2.26: Foreigner ratio in all industries (2008-2019) Japan (Sources: Statistics Bureau of Japan, 2020)

2.4.1 Changes in the Number of Foreign Workers in the Construction Industry

The Southeast Asian labour-importing countries rely on the foreign workforce to solve their labour shortage issues; Malaysia is one of them (Kaur, 2010). Foreign labourers consist of various levels such as professionals, skilled, semi-skilled and unskilled workers, majority of the foreign workers are concentrated in several major industries namely agricultures, manufacturing, construction and retails. The chief of the Construction Industry Development Board (CIDB) mentioned that the issue of shortage of labour is a critical issue that affects almost all sectors including construction industry in Malaysia, especially shortage of skilled labour in the construction industry (Zaki et al., 2010; UKessays, 2015; Theedgemarkets, 2022). The documented number of foreign workers in Malaysia has increased from an estimated 0.5 million in 1984 to 0.63 million in 1997 increased to 2.4 million in 1998; slightly decreased to 1.9 million in 2009, and then maintained approximately 2.1 million currently.

According to the Immigration Department of Malaysia, the number of employed persons in the construction industry has increased steadily. Malaysian employers have reached a stage where they are so dependent on foreign workers that a complete break from foreign

help is impossible. In Malaysia, almost all the economic industries are excessively dependent on foreign workers, these foreign workers hail from neighbouring countries such as Indonesia, Bangladesh, Thailand, Myanmar etc. Foreign workers are inexpensive, hard-working and will not resist 4D (Demanding, Dirty, Dangerous and Difficult) jobs that locals immediately shun. It has been stipulated under the 11th Malaysia Plan that the ratio of foreigners in the country's labour market must not exceed 15% or 2.1 million. According to the Human Resources Ministry, there are approximately 2.1 million registered foreign workers participating in the construction, plantation, agriculture, services, and manufacturing industries in Malaysia. However, the current ratio is far beyond what the labour market requires. The Malaysian Employer Federation estimates the total number of legal and illegal foreign workers at 6 million. In other words, the actual number of foreign workers involved in the construction industry is unknown.

Foreign Workers in Construction Industry in Japan

Majority of the foreign labourers who participated in the Japanese construction industry are from Vietnam, China and the Philippines. The number of foreign labourers from Vietnam is increasing from 30.6% in 2015 to 50.2% in 2019; while the rest of the foreign labour from China and other countries is decreasing (Figure 2.27). For instance, foreign labour from China shared approximately 32% of workforce in the construction industry, which reduced about 50% of involvement to approximately 15% in 2019; while foreign labour from other countries reduced from 14.8% in 2015 to 10.6% in 2019. The number of foreign workers from China has dropped as these foreign workers decide to return to China due to the currency of China increasing and the increasing wage in China, especially in the construction industry.

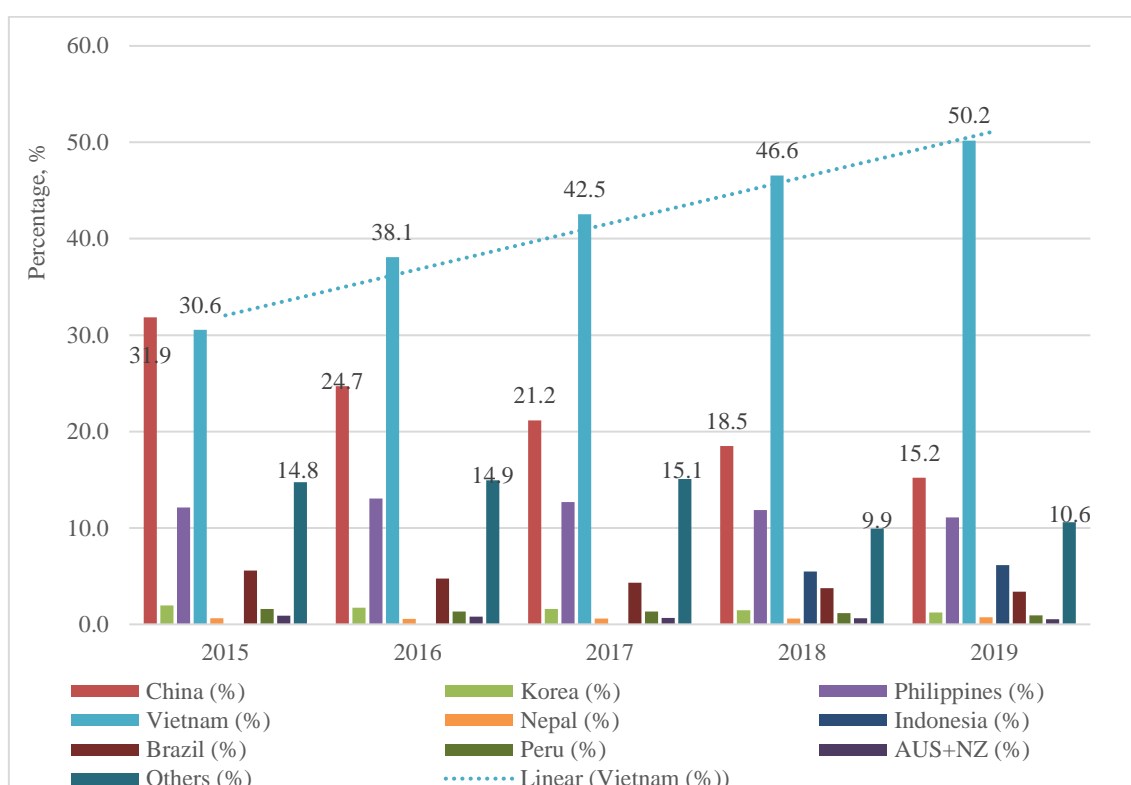


Figure 2.27: Distribution rate of foreign workers by nationality in construction industry Japan (2015-2019) (Source: Ministry of Health, Labour and Welfare, Japan)

2.4.2 Requirement of Construction Workforce in Japan and Malaysia

Technical Training Program for Foreign Construction Workers in Japan

The Technical Intern Training Program was established as a formal program in 1993 based on the high evaluation of training programs conducted by overseas local companies and others in the form of employee education starting in the late 1960s. The program aims to transfer skills, technologies, skills and knowledge accumulated in Japan to developing regions, to promote international cooperation by contributing to the development of human resources who can act as a key role in the economic development of those developing regions. The program has a period of five years. There are three categories under the program for both types trainee acceptance formats namely Technical Intern Training (i) – activities for skills etc. acquisition in the first year after entering Japan; Technical Intern Training (ii) – activities to enhance skills etc. in the second and third

years after entering Japan; and Technical Intern Training (iii) – activities to master skills etc. in the fourth and fifth years after entering Japan. The technical trainee must pass the specified evaluation examination, such as a written test and practical test under each category in order to shift to the next category. The technical trainee who undergoes the said program would be returning to their home countries after completion of the program. The contents of the program including the skills etc. which the technical intern trainee is acquire would be difficult to acquire in their home country; the skills etc., that cannot be acquired mostly through the repetition of simple work, post-entry lectures on subjects such as Japanese language, and immigration and labour related laws and regulations during first year after entering Japan. Particularly, the Japanese language education support for the trainee is one of the necessary criteria for the supervising organisation to achieve excellent performance. It has been a great achievement; however, it is not meant to compensate for the labour shortage in Japan (Article 2, Paragraph 2 of the Technical Intern Training Act).

The Recruitment of Foreign Construction Workers in Malaysia

The requirements for recruitment of foreign workers in the major economic industries do not include skill certificates before participating in the economic sectors in Malaysia. According to the Immigration Department of Malaysia, the requirement of foreign workers as follows:

- Work in permitted sectors, agriculture, construction, manufacturing, plantation, and services.
- Foreign workers' applications by employers or companies are subject to quota approval from the Local Approval Centre (OSC), Minister of Home Affairs.
- Be not less than 18 years old and not more than 45 years old at the time of application.
- Certification passes Immigration Security Clearance (ISC) validation conducted in the source country.
- Certified healthy by a health inspection centre in the source country.
- Prospective workers are not included in the list of foreign individuals who are prohibited from entering according to Section 8(3) of the Immigration Act

1959/1963, and

- Foreign workers must be recruited from an authorised source country as follows:
-

Table 2.10: Foreign workers for the occupation restrictions in Malaysia

Country	Sector / Occupation restrictions
Bangladesh	Plantation sector only via G2G agreement *Government to government (G2G) is a term used to describe interactions between governments at the national level.
Cambodia	All sectors (no restriction)
Laos	
Sri Lanka	
Thailand	
Vietnam	
India	Specific occupations in construction sector (high tension cable only) and Services sector (goldsmith, wholesale/retail, restaurant-cooks only, metal/scrap materials and recycling, textiles and barbers), Agriculture and Plantation. Not allowed in Manufacturing.
Indonesia	No restriction for female; male allowed for all sectors except Manufacturing sector.
Philippines	No restriction for male; female allowed in domestic helper segment only.
Kazakhstan	No restriction, except the domestic helper sector.
Myanmar	
Nepal	
Pakistan	
Turkmenistan	
Uzbekistan	

*Requirements for recruitment of foreign workers retrieved from Immigration Department of Malaysia Ministry of Home Affairs online at <https://www.imi.gov.my/index.php/en/main-services/foreign-worker/>, December 2022.

Application Procedures

The process to hire or to recruit a foreign worker is complex in Malaysia. It is necessary to discuss the institutional arrangements with the Ministry of Home Affairs (MOHA), Ministry of Human Resources (MOHR), Ministry of Health (MOH) to implement the foreign worker policies (set out by Cabinet Committee on Foreign Workers and Illegal Immigrants), the Foreign Workers Compensation Scheme (FWCS) by MOHR (2023), and the Foreign Worker Hospitalisation and Surgical Insurance (SPIKPA) by MOH (2023). The health care scheme is compulsory and a prerequisite for a VP(TE) for all foreign workers (except for plantation workers and domestic helpers) (World Bank, 2019).

The employers must register their foreign workers (all sectors and trades) under the Social Security Organisation and contribute to the Employment Injury Scheme which is to replace the FWCS effective from January 2019. The employer must obtain a letter from

the Department of Labour Peninsular Malaysia (JTKSM) to confirm whether the employer made efforts to recruit local workers through the Job Clearing System / Jobs Malaysia. The employer then seeks permission for a foreign worker quota from MOHR to check whether the employer complies with the qualifications and requirements to recruit a foreign worker. Before proceeding to the recruiting process, according to the application procedures on Immigration of Malaysia, it consists of two phases as follows:

Phase 1 (Pre-Arrival)

1. Employers must first get the PASS Immigration Security Clearance (ISC) result at the ISC centre in the source countries.
2. Employers must first apply to the Immigration Department for a Visa with Reference (VDR) approval before employing foreign workers.
3. Application forms from VDR can be submitted either at the Immigration counters or online via the e-Services system.
4. VDR application must follow this checklist:
 - a. VDR application form
 - b. Approval letter from Ministry of Home Affairs (Quota approval)
 - c. Original receipt of payment for levy
 - d. IM.12 and IM.38 forms (Visa Pass application forms)
 - e. Security bond-deposits / insurance guarantee / bank guarantee (insurance guarantee must be stamped and valid for at least 18 months)
 - f. Copy of the foreign workers' passports
 - g. Latest photo of the foreign workers (passport size)
 - h. Medical certificate from the medical centre in origin countries (valid for 3 months from the date of issuance)
 - i. Foreign Worker Compensation Scheme (insurance)
 - j. Insurance policy of health insurance protection scheme foreign workers – except for plantation sector
5. Foreign workers must remain in their respective countries while pending VDR approval from Malaysia Immigration Department.

Phase 2 (Post Arrival)

1. Foreign workers will only be allowed to enter the country at the authorised entry points using the VDR issued by the Immigration Department and entry visa issued by the Malaysian Attaches Office in the country of origin.
2. Employers must ensure that the clearance process of foreign workers at the entry points is done within 24 hours from the arrival time.
3. The issuance of Visit Pass (Temporary Employment) (VPTE) to the foreign workers will only be done after they have passed the Foreign Workers Medical Examination Monitoring Agency (FOMEMA) medical examination within 30 days which can be done at any medical centres registered with FOMEMA.
4. VPTE will be issued once the foreign worker is certified fit by a clinic/ medical centre registered with FOMEMA. Failing which, the foreign worker will not be allowed to stay and work in this country. Employers are required to apply for a check out memo for the repatriation of the foreign worker.
5. Issuance of VPTE shall be made at the Immigration Office which issued the VDR approval letter.

Foreign Workers (coloured) Identity Card by Sectors of Employment (i-card)

Foreign workers with valid VPTE will be issued the i-card and its validity period is the same with VPTE. The issuance of an i-card does not incur any additional cost to the employers, and it will be sent directly to the employer/company by the authorised vendor.

Extension of VPTE

1. VPTE is valid for a period of 12 months. Employers can apply for VPTE extension 3 months before the expiry date.
2. Employers must ensure the extension application is made before the VPTE expires. Any application submitted after the expiry date will be referred to the Immigration Enforcement Division for consideration.
3. Application VPTE extension must adhere to the checklist as follow:
 - The passport of the foreign workers is still valid for 12 months and above

- Application letter to extend the VPTE
- Identification document of employee/ company representative
- The security bond is a form of bank guarantee/ insurance guarantee/ deposit (validity period of bank guarantee/ insurance guarantee is at least 18 months)
- Insurance policy of Health Insurance Protection Scheme Foreign Workers – except for plantation sector
- Slip of Foreign Workers Compensation Scheme (FWCS)
- Foreign workers must undergo a medical examination and be certified fit by the clinic/ medical centre registered with FOMEMA (for 2nd and 3rd-year extension only)

Employment Period and Repatriation

1. Foreign workers are allowed to work in this country every year for up to 10 years. However, those registered under the 6P Program are allowed to work up to 3 years only. **The 6P programme was a 2011 initiative of the Ministry of Home Affairs of Malaysia to legalise as many as 2 million illegal immigrants working in the country.*
2. Upon completion or termination of employment, the employers must ensure that foreign workers are deported to their origin countries by using a check out memo. Security bonds can be claimed provided the repatriation process is done according to the check-out memo.
3. Foreign workers who hold the VPTE permit must adhere to the conditions such as family members are not allowed to accompany live in this country; must not work as a front liner; change of employers or employment sectors is not allowed and marriage is prohibited with local or foreign citizens in Malaysia.

Abscondment of Foreign Workers

Foreign workers can be categorised as abscondment when leaving the workplace without notifying the employers with the intention to escape; and not returning to the workplace after coming back from their country of origin. Employers are required to notify the

Immigration Department for absconded cases and must provide these documents, namely identification documents of employer/ company representative, copy of foreign workers' passport, foreign worker absconded form and valid police report. Foreign workers who commit the act of abscondment will be blacklisted by the Immigration Department. The security bonds will be confiscated.

In a nutshell, the entry requirement of foreigners to participate in the Malaysian construction industry is low; yet the procedure to hire the foreign workers is complex, while the enforcement of recruitment of foreign workers is unclear. Therefore, the low requirement attracts the foreign workers from neighbouring countries to enter Malaysia legally and illegally.

2.5 Issues related to Construction Workforce in Japan and Malaysia

Construction industry is expected to optimise the amount of manpower, resources and to execute the construction projects in a timely manner without compromising the quality of the best output. However, the safety and health of construction workers is neglected in this situation. The construction industry is facing the difficulties of obtaining adequate local workers due to unwillingness (Syed Jamalulil et al., 2022). However, this phenomenon has led to the need for foreign workforce to fill the vacancies in the industry, and due to the high demand, the industry does not pose many requirements for recruiting or hiring workers to carry out the works, or rather, there are no requirements, as long as the foreign labour is willing to work in the construction industry, the foreign labour able to secure the employment. This has led to subsequent problems in terms of the quality of products, including the safety hazards. According to the studied done by majority of the foreign workforce in the construction industry are unskilled workers which can lead to poor quality of works (Hamid et al., 2011; Ismail and Yuliyusman, 2014; Mohd Najib et al., 2019; Syed Jamalulil et al., 2022).

The productivity of the construction sector in Malaysian context seems to be lagging behind due to slow adoption of advanced technologies such as the use of technological tools (PMO, 2021) and heavy dependency on human power, especially the foreign labour

(Syed Jamalulil et al., 2022). In addition, shortage of labour joining the construction industry will have significant impact on the entire construction process as the industry is hard to attract local workers, especially the younger generation, to work on site due to the characteristics of the nature of work (Hamid et al., 2011; Mohd Najib et al., 2019).

The similar scenario occurs in the Japanese construction industry where Japan faces ageing issues among the population where prosperity has increased yet birth rates have declined which impact on all the industries (International Monetary Fund, 2001). Recent report by World Economic Forum (2018), stated that over quarter of the Japanese population is over the age of 65 and the Japanese government puts a lot of efforts by actively promotion and encouragement to sustain the economy by providing subsidies to citizens to increase the birth rate to address depopulation (Theguardian, 2023); while to sustain the construction development, Japanese government encourage the construction companies to invest on automation and robotic to overcome the shortage labour and ageing issues, for instance, Construction company Shimizu corporation spent approximately US dollar 27.7million invest in robotic in construction projects and research and development over three years to close the shortage labour gap in construction industry (World Economic Forum, 2018; Reuters, 2019). In contrast, the Japanese government is also confronted with topics related to natural disasters where the government has been spending on disaster relief to recover the country's development from natural disasters (Reuters, 2019).

To be particular, there are issues related to the workforce in the construction industry in terms of ageing issue, high entry requirement of recruitment in Japan; low entry requirement of recruiting foreign workforce and low awareness of upgrading skills among construction workforce in Malaysia. The following sections will be further discussed on each issue.

2.5.1 Ageing Issue, Young Generation among Japanese Local Refuse to Join Construction Industry

According to the Statistics Bureau of Japan (2022), the total population of Japan in 2021

was 125.5 million that made up 1.6% of the world's total population, yet, with the rate of population change about 1% from the 1960s until 1970s, the population growth started to decline drastically in the 1980s. Many articles and studies reported that young people refuse to join the construction industry. Developed countries such as the UK, the USA and Singapore are facing this issue. For instance, only approximately 6% of young people in the UK stated they are willing to work in construction sector and the average age of workers in the construction sectors is getting older (City&Guilds, 2022; pbctoday, 2022); while only 3% of young people are interested in the construction trades (Builder, 2017). The construction industry is not an attractive industry for job seekers, especially the young people in Singapore (The Straits Times, 2022). It seems to be a global issue occurring worldwide including in both Japan and Malaysia.

2.5.2 High Entry Requirement of Foreign Workforce to Join Japanese Construction Industry

The majority of foreign labourers that enter Japan are considered skilled labourers who must undergo the skills training program (JAC, 2023) because the presence of strict regulations regarding the foreign labour makes it difficult for unskilled foreign labourers to enter the Japanese construction industry.

2.5.3 Low Entry Requirement of Workforce to Join Malaysian Construction Industry

The population of the labour force in the working age group of 15 to 64 years is recorded by the Department of Statistics Malaysia, Ministry of Economy. Undeniably, the foreign workforce contributes to the country's economy, yet the current government policies towards the foreign workforce are far from ideal, which creates difficulties for employers to map out their long-term hiring policies. In particular, the lenient enforcement and the lack of effective mechanisms to manage foreign workers has resulted in millions of foreign workers exceeding the employment ratio, staying in Malaysia after the employment period as illegal foreign workers or coming to Malaysia illegally.

Researchers further proved that the presence of the illegal workers has had a significant impact on the construction industry in Malaysia which is highly dependent on foreign labour (Syed Jamalulil et al., 2022). Due to the loose regulations on recruiting foreign labour, many foreign workers are unskilled, and unskilled foreign workers lead to poor quality of work (Hamid et al., 2011; Mohd Najib et al., 2019).

According to Malaysia Standard Classification of Occupation (MASCO) (2008), the breakdown of employment by skill can be categorised into three groups namely: Skilled employment, semi-skilled employment and low skilled employment. Skilled employment including managers, professionals and researchers; technicians and associate professionals; while semi-skilled employment including clerical and related occupations such as service and sales workers, agricultural, forestry, livestock and fishery workers, craft and related trades workers, plant and machine operators and assemblers. In 2017, skilled workers comprised 24% (1,976 thousand persons), an increase of 0.5% compared to 2015. Semi-skilled workers were the largest category of occupational skill at approximately 61% (5,045 thousand persons in 2017 and 4724 thousand persons in 2015); and low skilled workers recorded approximately 15% (1,203 thousand persons in 2017) (Figure 2.28). The job market in Malaysia was dominated by low-skilled jobs such as elementary occupations, and the trend of favouring low-skilled jobs would directly affect youth and graduate unemployment. The influx of multitudes of illegal foreign workers and unskilled foreign workers is one of the keys to the current high rate of industrial accidents.

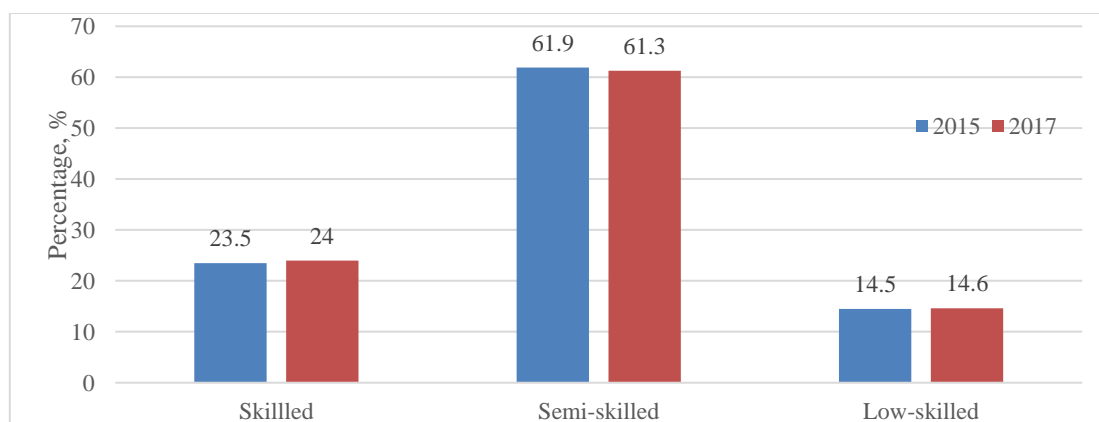


Figure 2.28: Full time paid employees in different categories for all industries in Malaysia (Sources: Department of Statistics, Malaysia)

Demands for foreign workers revealed professionals and technical-supervisors are positively related to output level and wage. However, the demand for semi-skilled and unskilled workers is still high due to the fact that total number of employment increases; it is negatively related to price of capital and local wage where the professional and technical-supervisor foreign workers complement the local workers and capital.

Industries would prefer to rely on the extensive use of semi-skilled and unskilled foreign workers, with the cheaper cost to engage labour intensive which will inhibit the use of advanced technologies within the firms, especially local workers who are reluctant to participate in certain industries such as construction and plantation, and services. However, the economic growth will be affected by the extensive use of foreign labour due to the unskilled and less productive foreign workers.

2.5.4 Low Awareness of Upgrading Skills among the Construction Labour Workforce in Malaysia

Most of the foreign workers arriving in Malaysia were not trained to fit the job or tasks which would directly affect the productivity and the quality control with the construction industry (Han, et al., 2008). Theoretically, the recruitment of foreign workers could provide a few possible negative effects including (i) a reduction in employment rates as employers would rather to hire foreign labour to replace local worker; (ii) an increase in the unemployment rate; (iii) reduction in vacancies; and (iv) the suppression of wage levels (Rachel and Jeniffer, 1995). The main reason employers would rather recruit of foreign workers in order to fill in the shortages and deficiencies for an insufficient number of domestic workers (Green et al., 2007). Undeniable, the performance of foreign labour has a positive impact on economic growth, Singapore is one of a good example of neighbour country of Malaysia, majority of foreign workers that enter Singapore are skilled labours due to the presence of strict regulations towards foreign labour that makes it difficult for unskilled foreign labours to work in Singapore (Ismail and Yuliyusman, 2014). Another study found in Cyprus, that highly educated and skilled foreign labourers have a positive impact on the economic growth while less educated and unskilled foreign

labourers will lead to a negative impact (Christofides et al., 2007).

2.6 Effects of Construction Accidents towards Construction Company in Malaysia

Safety and health are considered as one of the construction project success criteria to ensure the construction project quality (Konno, 2018). The increase of construction accidents with no effective measures taken would directly bring impacts to the company and the industry in the long term. Lack of budget allocation to safety measures cost for construction projects is one of the issues occurring in the countries of Southeast Asia. The items of project costs are to include the safety measures costs are common temporary facilities such as traffic control, safety facilities, safety management, on-site administration costs such as labour safety and health costs, employee training costs, etc. Insufficient resources are one of the major barrier that can lead to negative impacts towards safety and health in construction industry (Buniya et al., 2021) especially the project performance such as cost overrun (Meng and Gallagher, 2012), damages to the company's reputation (Ayob et al., 2018), delay of construction project completion (Hamid et al., 2019), lost confidence among stakeholders and workforce, receive penalties from relevant authorities (Chim et al., 2018) which lead to the dissatisfaction from public.

Chapter 3 Causes of Construction Accidents in Construction Industry

This chapter aims to discover the factors that contributed to the construction accident in the Malaysia construction industry to fill the gaps discovered in the previous chapters. Safety issues are considered as the major concerns in the construction industry. Despite the rapid advancement of technology, it is revealed that the rate of fatality in the construction industry is extremely high (Bavafa et al., 2018). In this chapter, the common factors directed to the unsafe behaviours and unsafe conditions contributed to construction accidents will be further explained. The last part of this chapter aims to discover the current scenarios of the Malaysian construction industry in order to better understand the current situation of construction safety and health related issues in Malaysian context which eventually could initiate to enhance knowledge among construction stakeholders and figure out various effective solutions to solve the current issues.

3.1 Factors Contributed to Construction Accidents in Malaysian Construction Industry

This research leverages the content analysis-based review method (Yi and Chan, 2013) which has been a well-recognized method for reviewing and synthesising literature and rationalising outcomes, and it has been widely used in the research field of engineering / construction management (Mok et al., 2015; Liang et al., 2016). Literature review was adopted in this research to identify the factors, barriers and impacts for construction accidents occurring in large-scale construction projects and then to review the previous research related to how to solve current safety issues in the construction industry. This provides an important support for the further study of improving the safety and health management of construction projects.

According to the famous Heinrich's theory of accident causation, most of the accidents are caused by a combination of unsafe acts and unsafe conditions (Heinrich, 1931). According to Industrial Accident Prevention published by Heinrich in 1941, 98% of industrial accidents are preventable while 88% of all industrial accidents were caused primarily by the unsafe acts of a person. Preventable accidents or injuries occur as a natural consequence of a series of events or circumstances that are always in a fixed logical sequence. According to Heinrich (1936, cited by Chi and Han, 2013), there are five sequential elements that contributing to a construction accident injury in ascending way 1) ancestry and social environment, 2) fault of a person, 3) unsafe act and mechanical or physical hazards, 4) accident and lastly 5) injury (Heinrich, 1941). All the five contributing elements are connected with each other and lead to an accident causing the worker injuries. Researchers identified that most of the construction accidents were associated with unsafe acts and preconditions for unsafe acts (Vongpaisal and Yodpijit, 2017). In large-scale construction projects, the accident rate is higher than common construction projects due to the involvement of many workers, large and heavy plants and equipment, huge number of materials, complex construction operation and sequences, multi-interface, as well as the complex management activities. Therefore, it is significant to improve the safety management in large-scale construction projects. The identification

of causes of accident occurrence is the prerequisite of the improvement of safety management (Guo et al., 2013).

3.1.1 Unsafe Behaviours

Unsafe behaviours defined as a person violated established safety procedures, taking shortcuts that could lead to a loss, an injury or both. Worker unsafe actions were identified to be the factor in most of the accidents (Choudhry and Fang, 2008; Winge et al., 2019), where construction workers decide how the works jeopardise their ability to identify potential risks on construction sites that could lead to accidents. For instance, falling from height is the common accidents that could lead to serious injuries and death to the workers due to not compliance to safety procedures, improper use of personal protective equipment and hazardous environment (Nadhim et al., 2016). Furthermore, lack of trained construction workers would automatically result in bad safety behaviours due to poor safety knowledge and awareness on how to work safely at construction sites (Buniya et al., 2021).

3.1.2 Unsafe Conditions

Unsafe conditions can be defined as a hazardous circumstance or a situation that could eventually lead to an accident. The unsafe working environmental conditions (Hoła et al., 2017; Peng and Chan, 2020) such as cluttered working environment with surrounding objects or structures, exposure to hazardous injury sources (Gibb et al., 2009) such as poor weather conditions, tools and equipment malfunction, in favourable conditions can increase the probability of the construction accidents. The organisation, individual characteristics and site condition are highly associated with unsafe behaviours and construction accidents (Khosravi et al., 2014). Accidents could happen anywhere at any time to anyone in every construction project that is caused by unsafe behaviours, unsafe conditions or both. However, accidents do not happen naturally by itself but are passively or intentionally caused by man-made or unsafe circumstances.

Construction accidents are related with various project factors such as site layout, materials, tools, plants and equipment as well as other trade work-forces that make up a volatile site environment (Park and Kim, 2013). Language and communication barrier is a key obstacle in managing construction safety international construction (Hudson, 2007). The transfer of information between supervisors and workers or among workers from different countries who speak several languages could be challenging and ineffective which could lead to unsafe behaviours.

Several factors that contributed to construction accidents involved with the construction workers were identified by previous studies. Unsafe workers' behaviours (Choudhry and Fang, 2008) such as failure to recognize safety hazards (Ismail et al., 2018) attitudes towards not wearing personal protective equipment (PPE) or misuse of PPE is often neglected (Yiu et al., 2018; Ammad et al., 2021); failure to follow safety procedures during operation (Ayob, et al., 2018), improper supervision and safety control (Nduka et al., 2018), lack of safety knowledge and training (Yiu et al., 2019).

Furthermore, lack of trained construction workers would automatically result in bad safety behaviours due to poor safety knowledge and awareness on how to work safely in construction sites (Buniya et al., 2021). Besides, the unsafe working environmental conditions (Peng and Chan, 2020) such as dangerous required working actions during machinery operation, irregularly assigned tasks, cluttered working environment with surrounding objects or structures, poor working surface conditions (Adnan and Baharum, 2020), exposure to hazardous injury sources (Gibb et al., 2009) such as poor weather conditions, tools and equipment malfunction were found and these factors, in favourable condition can increase the probability of the construction fatal accidents.

Furthermore, there are additional factors such as lack of effective safety information flow on site (Zhou et al., 2015); lack of unsafe behaviour monitoring (Choudhry and Fang, 2008); lack in applying safety climate to accident prediction (Mohamed et al., 2009); ignorance of quantitative relationship identification between project / company scale / size and construction safety (Zhou et al., 2015); lack of construction safety research at the task level (Zhou et al., 2015); and lack of innovative technology application in construction industry practice (Zhou et al., 2015) that contributing to the safety and health

in construction site.

The existing safety and health assessment is mainly concentrated on the noticeable outcomes such as the trend of accident statistics, critical accident types, related accident and safety issues reported on news and so on. Particularly, it is difficult to tackle the missed behaviour in time (Ammad et al., 2021). Therefore, investigating the factors contributing to construction accidents could be useful for accident prevention as to promote easy implementation and immediately effective safety performance (Shao et al., 2019). There were many researchers have discovered and explored the factors contributing to the construction accidents over the past two decades (Abdelhamid and Everett, 2000; Choudhry and Fang, 2008; Hu et al., 2011; Mahmoudi et al., 2014; Khosravi et al., 2014; Kang et al., 2017; Zheng et al., 2018). The unsafe acts and conditions contributed to construction accidents involved with the construction workers identified in the previous studies were tabulated in Table 3.1.

Table 3.1: Factors contributed to construction accidents

Factors contribute to construction accidents	References
Failure to recognize safety hazards	(Ismail et al., 2018)
Attitudes towards misuse of PPE	(Williams, 2017; Yiu et al., 2018; Ammad et al., 2021)
Failure to follow safety procedures during operation	(Ayob, et al., 2018)
Improper supervision and safety control	(Nduka et al., 2018)
Lack of safety knowledge and training	(Yiu et al., 2019; Buniya et al., 2021)
Dangerous required working actions during machinery operation	(Peng and Chan, 2020)
Irregularly assigned tasks	(Peng and Chan, 2020)
Cluttered working environment with surrounding objects or structures	(Peng and Chan, 2020)
Poor working surface conditions	(Adnan and Baharum, 2020)
Exposure to hazardous injury sources	(Gibb et al., 2009)

During construction activities, workers encounter accidents and cause injuries when workers perform certain unsafe behaviours or contact directly with the unsafe conditions such as mechanical or physical hazards related to the work. However, all the unsafe behaviours and conditions can be controlled through the provision of effective and comprehensive safety and health training and education with the support from social and

organisational, thereby to reduce the number of accidents by understanding the root causes of the unsafe behaviours and conditions on construction sites.

Table 3.2: The basic human factors that lead to accidents are indicated in the Table 14 basic causes of accidents in NADOPD Regulation 2004 in Malaysia.

Personal factor	Description
Improper motivation	Excessive frustration; improper attempt to avoid discomfort; improper attempt to save time or effort; improper attempt to gain attention; improper production incentives; improper performances is rewarding; inadequate performance; inadequate reinforcement of proper behaviour; inappropriate frustration; inappropriate supervisory example; lack of incentives; proper performances is punishing.
Inadequate mental / psychological capability	Emotional disturbance; fears and phobias; inability to comprehend; intelligence level; low learning aptitude; low mechanical aptitude; memory failure; mental illness; poor coordination; poor judgement; slow reaction time.
Inadequate physical / physiological	Hearing deficiency; inappropriate height, weight, size, strength, reach, etc.; limited ability to sustain body positions; respiratory incapacity; restricted range of body movement; sensitivities to sensory extremes (temperature, sound, etc.); substance sensitivities or allergies, temporary disabilities; vision deficiency; other permanent physical disabilities; other sensory deficiency (touch, taste, smell, balance).
Lack of knowledge	Inadequate initial training; inadequate orientation; inadequate training; lack of experience; misunderstand directions.
Lack of skill	Inadequate initial instruction; inadequate practice; infrequent performance; lack of coaching.
Mental or psychological stress	Conflicting demands; confusing directions; emotional overload; extreme concentration / perception demands; extreme judgement / decision demands; fatigue due to mental task load or speed; frustration; meaningless or degrading activities; mental illness; preoccupation with problems; routine monotony; demand for uneventful vigilance.
Physical or physiological stress	Atmospheric pressure variation; blood sugar insufficiency; constrained movement; drugs; exposure to health hazards; exposure to temperature extremes; fatigue due to lack of rest; fatigue due to sensory overload; fatigue due to task load or duration; injury or illness; oxygen deficiency.

3.2 Current Scenarios in Malaysian Construction Sites through Questionnaire

A wealth of suggestions and knowledge can be gleaned from the literature of the past. However, in order to utilise them properly, there is a need to understand the actual conditions of construction sites. To address the research gaps, there is a need to conduct

an investigation as to exemplify the current situation of construction safety and health related issues in Malaysian context which eventually could initiate to enhance knowledge among construction stakeholders and figure out various effective solutions to solve the current issues. The objectives were formed to achieve the aim as: 1) to identify the current safety and health practices on construction sites, 2) to determine the critical factors contributed to construction accidents, and 3) to determine the barriers to implementing OSH practices on construction sites, 4) to investigate different grades of contractors' perceptions toward safety and health practices.

The ultimate objective of this study is to understand the current situation of safety and health issues in the construction industry in Malaysia and to find effective solutions. The first objective includes the understanding of the employment situation of foreign workers at construction sites and the actual situation of safety and health management efforts at construction sites. The following objectives help to determine the construction site personnel awareness on safety and health by focusing on factors contributing to accidents, barriers to implement OSH programmes at construction sites, and the significant impact of accidents in the construction industry. These objectives will be organised as basic information to contribute to improve safety and health at construction sites in future.

3.2.1 Method

This study aims to provide an understanding on the actual situation at construction sites regarding the foreign workers and the status of safety and health efforts, as well as to understand the perceptions of site personnel regarding these factors. As a result, this study is able to provide useful information for safety and health management at construction sites. To achieve the objectives, a quantitative approach was designed for this study as it can provide evidence to help to address the current issues and act as a good basis for future research. Quantitative approaches are able to gain the insights in order to understand people's perceptions towards the situation (Fellows and Liu, 2008), and it is able to adapt for testing on the objectives by examining the relationship among the variables (Creswell, 2014).

Questionnaire conducted with the construction personnel to validate the list of variables such as the factors contributed to accidents and barriers to implementing OSH practices identified from the literature review. The questions were divided into four major sections with close-ended questions, open-ended questions, and five-point Likert scale questions. The first section solicits the background of the respondents and the respondents' company profile, while the second focuses on the current safety and health practices on construction sites; the third section solicits the factors contributed to the construction accidents; the fourth section solicits the barriers to implementing OSH practices on construction sites.

This study will be conducted using a sampling design based on the companies under construction section listed on the Construction Industry Development Board (CIDB) until 2019. The targeted population was the contractors registered under the CIDB of Malaysia, the category of grade of contractor is based on their financial capacity such as company capital, and the financial resources that will affect the tendering capacity based on each grade (G1 to G7). The target population is the participants of construction projects who have experience for safety and health in the construction industry. A survey was conducted of the construction site personnel. The target respondents were safety officers, project managers and contractors where they are the key people who are supposed to have the broad exposure and involvement during the design and construction stage. Therefore, their role and responsibilities in safety and health management are explicit. A random stratified sampling is applied to identify the required sample from each grade. A 5% margin of error and 95% confidence interval is considered when measuring the sample size (Fellows and Liu, 2008). The survey was directed to a total sample size of 383 construction companies undertaking building works. A total of 116 valid surveys (30% of response rate) were collected via *Google* survey within one-month period.

3.2.2 Questionnaire Design

Questionnaire surveys will be collected through email methods in order to reach the personnel who are working in the construction industry directly. The respondents are required to answer several sections consist of the respondents' demographic information

and the company profile, the current practices of safety and health in their construction companies, types of accidents occurred in respondents' construction site, factors contribute to the accidents; impacts of construction accidents, barriers of the implementation of OSH programme at construction sites. Table below indicated the questionnaire design.

The survey consisted of questions about the profile of the respondents and their companies, the employment status of foreign workers, the status of safety and health initiatives of the companies managed by the respondents. In addition, a series of questions using Likert scale ("Strongly Disagree" – "Strongly Agree") was designed to capture the respondents' awareness on "factors contributing to construction site accidents", "barriers of implementation of OSH programme at construction sites", and "impacts of construction accidents". A list of these questions is given in the following section. First, the trends of the collected responses are examined by using frequency analysis. Next, analysed the actual situation of foreign workers employed at construction sites and the respondents' perspectives towards the foreign workers. Subsequently, the respondents' approach toward safety and health at construction sites is analysed. Lastly, the factors that contribute to construction accidents, barriers of implementation of OSH programme, and the respondents' perspectives on the impact of accidents in construction sites were analysed by using statistical analysis in order to extract the common perspectives of construction site personnel in these three areas. The findings will be discussed in a line with survey questions.

There were six (6) parts of the questions. A total of 43 questions.

Section A – Respondents' Profile (short answer)

A-1: Position in your company

A-2: Your working experience in construction industry (short answer)

Section B – Respondents' Company Profile

B-1: Main construction area (select one)

B-2: Your company registered under CIDB on which grade? (Select one)

B-3: How many regular workers does your company have? _____persons

B-4: What is the ratio of (F)foreign workers and (L)local workers in your company?

B-5: How is the wage paid for the foreign workers in your company? (Multiple choice)

B-6: The nationality of foreign workers works in your construction site (Multiple choice)

- B-7: The age group of the foreign workers (Multiple choice)
B-8: How is the work attitude from foreign workers compared to local workers? (Multiple choice)
B-9: What are the languages that your site foreign workers normally speak during working on site? (Multiple choice)
B-10: Which types of construction accidents happened in your construction site, especially on foreign workers? (Multiple choice)
-

Section C - Awareness towards safety and health in construction company

- C-1: Does your company own a safety and health policy for employees? (Yes/No)
C-2: Does your company provide a health and safety training program for all employees? (Multiple choice)
C-3: Does your company own a specified department responsible for safety and health in construction sites? (Yes/No)
C-4: Does your company keep records of all the accident cases that occur in your construction site? (Yes/No)
C-5: How frequent were construction related accidents(s) occurring in your construction site last year? (Likert scale)
C-6: Does your company carry out safety and health activities for your workers? (Multiple choice)
C-7: Do you think the current safety activities of the workers that are implemented are sufficient? (Multiple choice)

Section D – Factors contributed to the accidents in construction site (Likert Scale 1-5, 5=Strongly Agree)

- D-1: Failure to recognize safety hazards
D-2: Attitudes towards not wearing personal protective equipment (PPE)
D-3: Failure to follow safety procedures during operation
D-4: Improper supervision and safety control
D-5: Lack of safety knowledge and training
D-6: Dangerous required working actions during machine operation
D-7: Irregularly assigned tasks
D-8: Cluttered working environment with surrounding objects or structures
D-9: Poor working surface conditions
D-10: Exposure to hazardous injury sources (External factors)
-

Section E - Barriers of the implementation of Occupational Safety and Health (OSH) program in construction site (Likert Scale 1-5, 5=Strongly Agree)

- E-1: Lack of technical support by consultants
E-2: Lack of awareness of OSH relevance by workers
E-3: Inadequate OSH policy
E-4: Inadequate dedication of time
E-5: Lack of effective communication
E-6: Prioritisation of production over safety
E-7: Lack of budget allocation for OSH program

Section F - Impacts of accidents towards construction company (Likert Scale 1-5,

5=Strongly Agree)

F-1: Cost overrun

F-2: Damages to the company financial stability

F-3: Damages to the company's reputation

F-4: Delay of construction project completion

F-5: Lost confidence among stakeholders and workforce

F-6: Penalties from relevant authorities

F-7: Dissatisfaction from public

3.2.3 Results and Discussion

The obtained data were coded and entered into the Statistical Package for Social Science (SPSS) for further statistical analysis to determine the respondents' demographic and the current practices on safety and health; while the Levene's test and Kruskal-Wallis test tool were used to determine the contractor's perspectives towards the factors contributed to construction accident and the barriers to implementing OSH practices on construction sites.

Overview of Respondents' Profiles

The targeted population was the main contractors registered under the Construction Industry Development Board (CIDB) of Malaysia, the category of grade of contractor is based on their financial capacity that will affect the tendering capacity based on each grade. A random stratified sampling is applied to identify the required sample from each grade. A 5% margin of error and 95% confidence interval is considered when measuring the sample size (Fellows and Liu, 2008). The survey was directed to a total sample size of 383 (overall total population is 105,503 until 31 May 2020) construction companies undertake building works. A total of 116 valid surveys (30% of response rate) were collected via Google survey within one-month period. The data obtained from the target respondents were 50% work under Grade 7 and below Grade 7 construction companies respectively. Table 3.3 presented the respondents' demographic information and company profile.

Table 3.3: Respondents' demographic information and company profile.

Respondents' Profile	Contractor Grade		
	below G7	G7	
Position in your company	no. of contractors		total
Safety and Health Office (SHO)	33	27	60
Project Manager	11	20	31
Site Manager	14	7	21
Site Engineer	0	1	1
Site Supervisor	0	3	3
total	58	58	116
Your working experience in construction industry			
1-5 years	4	8	12
6-10 years	21	12	33
11-15 years	20	31	51
16-20 years	10	7	17
21 years and above	3	0	3
total	58	58	116
Respondents' Company Profile (main area)	Percentage, %		
Building / construction management	87.1		
Civil Engineering	7.8		100%
Mechanical & Electrical Engineering	5.2		
Grade of company registered under CIDB	no. of contractors		
below Grade 7	58		
Grade 7 (G7)		58	116

The data obtained from the target respondents consists of 60 Site Safety and Health Officer (SHO), 31 Project Manager, 21 Site Manager, 3 site supervisors and 1 site engineer. Majority of the respondents' construction working experience are falls under 6 to 15 years with 28% of 6 to 10 years and 44% of 11 to 15 years, 14.7% of 16 to 20 years of working experience, 10% of 1 to 5 years of working experience and 2.6% of 21 years of working experience who are having the major involvement in building construction area (87.1%) which also involved of civil engineering (7.8%), mechanical and electrical engineering (5.2%). 50% of the respondents work under Grade 7 construction companies, and 50% of respondents work under Grade 1 to Grade 6 construction companies. More than half of the respondents have at least 300 regular workers in construction sites and less than 40% of respondents have between 100 to 300 regular workers in their construction site.

Employment Status and Construction Accidents of Foreign Workers

The motivation for obtaining construction related information varies among different

sizes of companies. More than half of the respondents have at least 300 regular workers on construction sites. Surprisingly, most of the respondents are willing to provide the ratio of foreign workers and local workers. Majority of the construction companies employ more foreign workers (F) than local workers (L) namely 5F:1L (39.7%), 9F:1L (46.6%). Others (13.9%) included 20F:1L, 8F:2L, 7F:3L, 2F:1L, 1F:0L, 10F:0L, and 1F:4L from the respondents. Majority of the construction site is constituting by foreign workers especially from these neighbourhood countries: Indonesia (100%), Bangladesh (96.6%), Vietnam (96.6%), Myanmar (86.2%) and Pakistan (69%), and all of the construction sites is constituting by Indonesia foreign workers (Figure 3.1).

The common languages used during working on site by foreign workers are Bahasa Malaysia (99.1%), native languages (97.4%) and English (18.1%). Besides, the age group of the foreign workers in the respondents' construction site are mainly 21 to 50 years old. Employers are preferable to hire young age persons as blue-collar workers in construction sites. The construction workers under 45 years old are more likely to contribute to the highest rate of falling fatalities in the United States (Dong et al., 2013). The wages for construction foreign workers are mainly on a monthly salary basis which also includes overtime claims. Only 0.9% of weekly wage and 1.7% of hourly wage obtained from the respondents. This result also represents that most of the construction companies prefer to pay the salary on a monthly basis to the construction foreign workers.

The common types of accidents occurring in construction sites especially on foreign workers were falling from height, injured by plants or equipment, hit by fallen objects, cut by, crashed by, electric shock and contact with harmful chemicals or substances (Figure 3.2). The overall results are quite similar with the fatal accident cases investigated by DOSH in recent years except the electric shock.

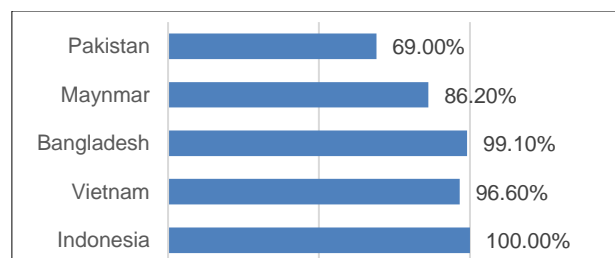


Figure 3.1: Nationality of foreign workforce

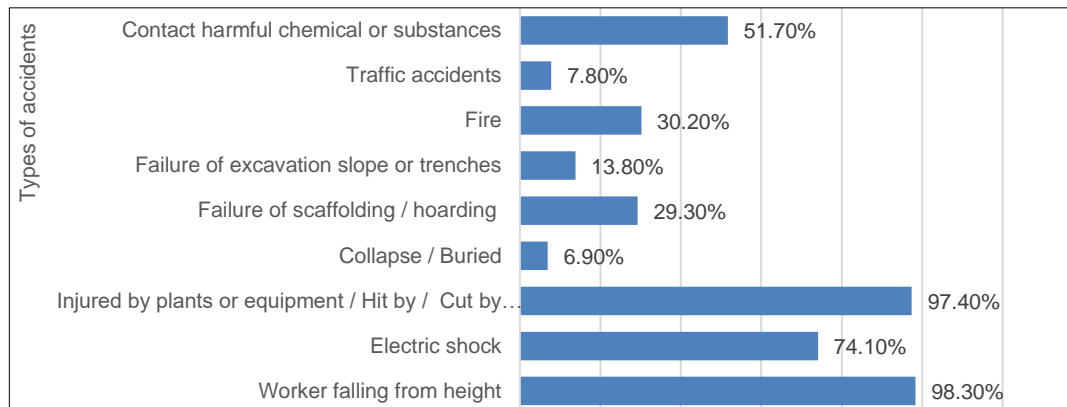


Figure 3.2: Common types of construction accidents in construction site

From the obtained data, the majority of the respondents are not satisfied with the foreign workers' working attitude, especially poor communication skills (89.3%), reluctant to acquire skills (64.1%) and not serious and negligent (44.7%). Only a small group of respondents prefer foreign workers due to their positive attitude of willing to learn (26.2%) and serious and enthusiastic (16.5%) towards working attitude. In the eyes of the targeted respondents, foreign workers do not have high communication skills especially during working hours and one of the reasons is mother tongue and Bahasa Malaysia are the common language used by foreign workers during working hours.

Organisational Efforts to Prevent Construction Accidents

Own Safety and Health Policy for Employee and In-house Safety and Health Department

Majority of the construction companies are aware of safety and health policy among all the employees (96.6%); and 3.4% of construction companies stated partial employees are aware of the policy; 96.6% of construction companies own their in-house safety and health department while 3.4% of construction companies stated the safety and health department handled by another department. All the construction companies did keep construction site accidents record.

Construction Accidents Occur at Construction Sites

In this part, the responses toward the frequency of construction accidents that occurred in construction sites last year were using a 5-point Likert scale, (1=Very frequently, 5=Never). 18% of companies never have construction accidents; 64.7% of companies answered very rarely; 10% of companies encountered a rare construction accident; 6% of companies occasionally have construction accidents and only 0.9% of construction companies have very frequently had construction accidents occur in construction sites last year. The frequency of construction accidents occurring in construction sites is considered low.

Safety and Health Activities for Construction Workers

The current safety and health activities practices for workers in construction sites are tool box meetings, various training such as fire drills or evacuation drills, work procedure education, and education for newcomers (Figure 3.3). Yet, the activities such as dangerous machine and materials handling education (20%), education at the time of employment (25%) and information sharing on accident cases (4.3%) were low response in the respondents' companies. The current implementation of safety activities on construction sites are not sufficient due to unsafe conditions and actions at sites will not decrease due to limited budget allocation and lack of resources for safety activities. The results show that many of the respondents conduct toolbox meetings as common practices on construction sites however, it might not be effective to educate workers of different trades and remind workers aspects of safety and potential hazards and risks at every morning prior to beginning the works.

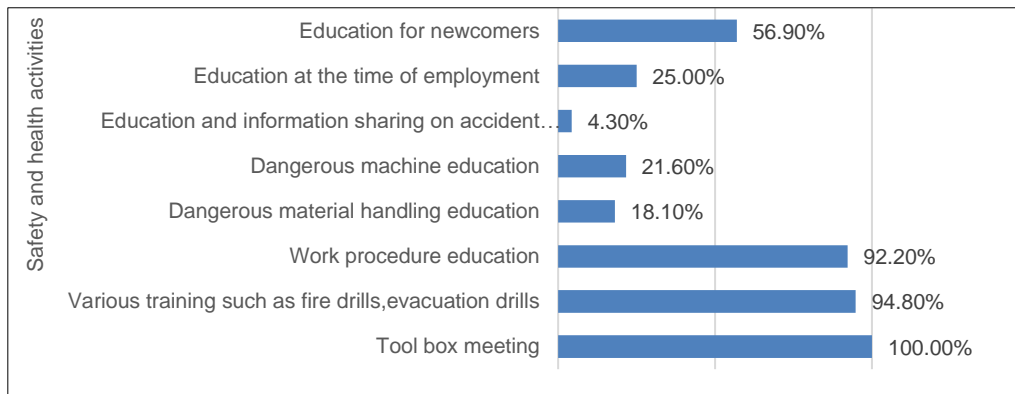


Figure 3.3: Safety and health activities practices for workers

Safety and Health Training Programme Period

Majority of the construction companies (86.2%) implement safety and health training programme every 6 months to 12 months' period; 6% of construction companies prefer to carry out safety and health training by every 1 month to 3 months' period; 5.2% of construction companies carry out safety and health training programme more than 1 year; and 2.6% of companies only provide safety and health training programme to newly joined employees only. The frequency of construction accidents occurring on construction sites is considered low. Table 3.4 presented the details of the current safety and health practices in the respondents' company.

Sufficiency of the Current Safety and Health Activities to Workers

Respondents are allowed to choose more than one answer for this question. Majority of the respondents stated the current implementation of safety activities in construction site is not sufficient due to unsafe conditions and unsafe actions at site will not decrease (52.6%); 35.3% of respondents stated the current implementation of safety activities practise in their construction site is sufficient; while, 37.9% of respondents stated the current implementation of safety activities is construction site is not sufficient due to limited budget allocation for safety activities; 33.6% of respondents stated not sufficient because there is not effective safety activity, and 30% of respondents stated not sufficient due to lack of resources such as manpower and materials to carry out safety activities in

construction site.

Table 3.4: Details of the current safety and health practices in the respondents' company

	Contractor Grade		
	below G7	G7	total
Does your company own a safety and health policy for employees?			
Yes, all employees are aware of the policy	55	57	112
Yes, partial employees are aware of the policy	3	1	4
total	58	58	116
Does your company provide health and safety training programmes for all employees?			
1 month - 3 months	0	7	7
6 months - 12 months	51	49	100
1 year and above	6	0	6
New employees only	1	2	3
total	58	58	116
Does your company own a specified department responsible for safety and health on a construction site?			
Yes	54	58	112
Partially yes, but handle by another department	4	0	4
total	58	58	116
Does your company keep records of all the accident cases that occur in your construction site?			
Yes	58	58	116
total	58	58	116
How frequent construction related accident(s) occurred in your construction site last year?			
Very Frequently	0	1	1
Occasionally	6	1	7
Rarely	8	4	12
Very Rarely	37	38	75
Never	7	14	21
total	58	58	116
Do you think the current safety activities for foreign workers are sufficient?			
Yes, sufficient	11	30	41
Not sufficient	47	28	75
total	58	58	116

3.2.4 Respondents' Awareness on Safety and Health Issues

Factors Contributed to the Construction Accident in Construction Sites

More than half of the respondents answered “strongly agree” to the following six items: attitude toward not wearing PPE (Mean of 4.84); lack of safety knowledge and training (Mean of 4.81); failure to follow safety procedures during operation (Mean of 4.78); failure to recognize safety hazards (Mean of 4.75); improper supervision and safety control (Mean of 4.6); dangerous required working actions during machine operation

(Mean of 4.55). Among them, the items other than “improper supervision and safety control” are supervisors’ perceptions of worker’s behaviour. The remaining four items: cluttered working environment with surrounding objects or structures (Mean of 4.37); poor working surface conditions (Mean of 4.35); irregularly assigned tasks (Means of 4.33); and exposure to hazardous injury sources (Mean of 4.26) are majority supervisor instructions to workers. The Cronbach’s Alpha is 0.951 for ten (10) items under factors contributing to the construction accident in the construction site (Figure 3.4).

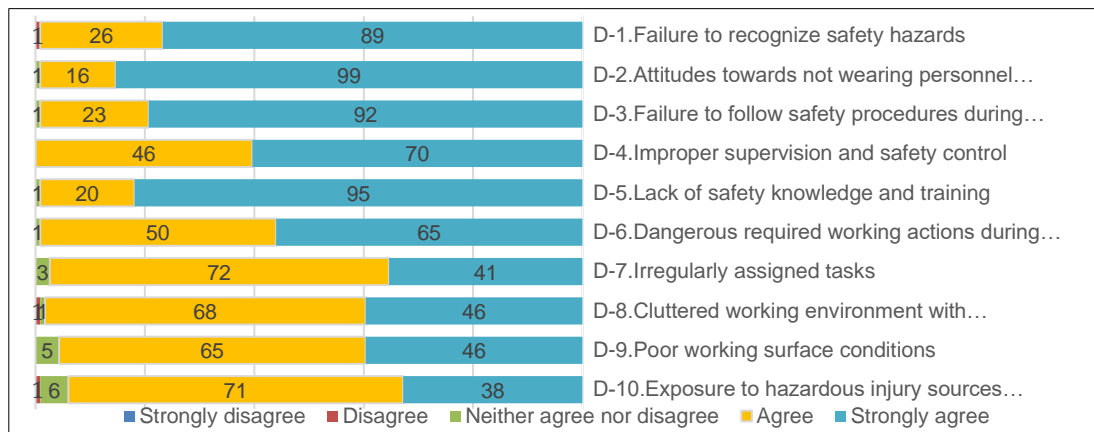


Figure 3.4: Respondents answered on factors contribute to the construction accidents

The results show prevalence with the previous studies on the factors causing accidents in high-rise building projects (Manzoor et al., 2021). Most of the time, the accidents are not completely contributed by workers on site, but the management of unsafe behaviours also plays a vital role to affect workers’ unsafe behaviours (Fang and Wu, 2013; Martin and Lewis, 2014). Therefore, the responsibility of maintaining safety and health is on both management and workers in the construction industry. Lack of safety and health knowledge and training could be improved by several methods, for instance, proposed several solutions to increase the employees’ willingness and self-motivation to attend safety and health training and ensure the OSH training is organised by a trustworthy organisation (Aziz and Ahmad, 2011).

Barriers of the Implementation of OSH Programme in Construction Sites

More than half of the respondents answered “strongly agree” to the following five items: lack of budget allocation for safety and health programme (Mean of 4.83); prioritisation of production over safety (Mean of 4.82), which is almost same ranking with the first barrier; lack of effective communication (Mean of 4.78); inadequate dedication of time (Mean of 4.70); lack of awareness of safety and health relevance by workers (Mean of 4.61). These are items related to the construction site environment. In comparison, the percentage of “strongly agree” is low for the two items that have caused outside of themselves, “inadequate safety and health policy” (Mean of 4.42); and “lack of technical support by consultant” (Mean of 4.24). The Cronbach’s Alpha is 0.933 for seven (7) barriers of the implementation of occupational safety and health programmes in construction sites (Figure 3.5).

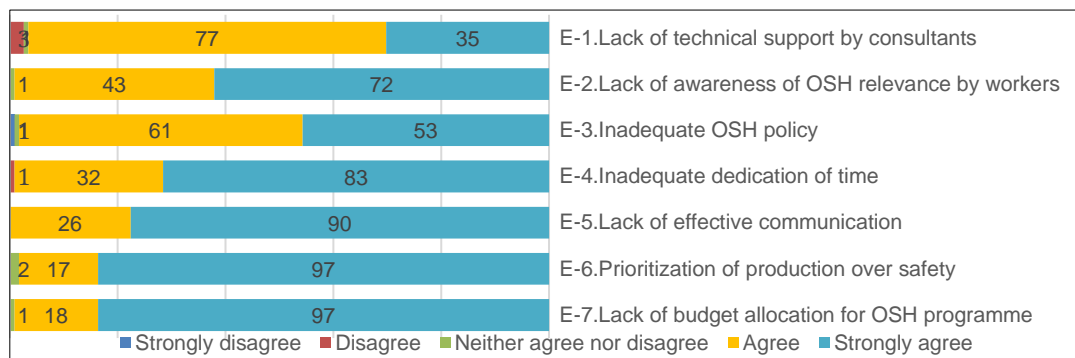


Figure 3.5: Respondents answered on barriers of the implementation of OSH programme

Lack of resources such as budget and infrastructure to develop and implement an effective safety and health programme are always an issue and limitation towards construction companies (Hallowell and Gambatese, 2010). The results are prevalent with the situation in Singapore (Goh and Chua, 2013), Hong Kong (Yiu et al., 2018) and the Middle Eastern construction industry (Buniya et al., 2021).

Critical Impacts of Construction Accidents towards Construction Company

More than half of the respondents answered “strongly agree” to the following four items: delay of construction project completion (Mean of 4.82); followed by cost overrun (Mean

of 4.81); damage to the company financial stability (Mean of 4.7); damages to the company's reputation (Mean of 4.53). These are items that directly damage the construction site and the company's management. On the other hand, less than half of the respondents strongly agreed with the three items that affect trust: punishment from relevant authorities (Mean of 4.39); lost trust from stakeholders (Mean of 4.34), and dissatisfaction from the workforce and the general public (Mean of 4.34). The Cronbach's Alpha is 0.930 for seven (7) impacts of construction accidents towards construction companies (Figure 3.6).

Delay of construction project completion and cost overrun are the critical impacts identified from this study. Generally, the construction would precede production over safety. Construction companies might overlook the importance of occupational safety and health issues and corporate commitment to safety and health is in danger of reducing attention to safety and health when company's profits decline and the economy turns weak. Construction companies pay more attention to the project completion on time and control the cost not to overrun instead of lost confidence among stakeholders and workforce and dissatisfaction from the public. DOSH stated the penalties for construction companies who neglected the site safety should be treated seriously in order to enhance the site safety effectively. Contractors should carry out their obligation through a firm realisation of safety compliance to safety requirements and ensure that all staff are certain about their safety and health responsibilities (Zin and Ismail, 2012).

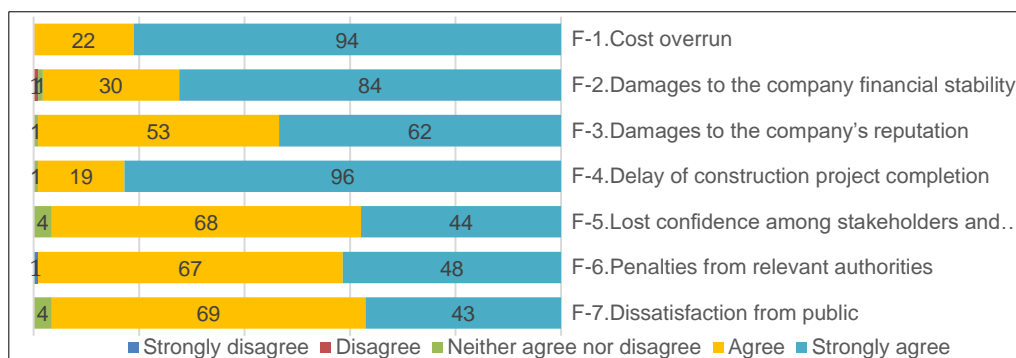


Figure 3.6: Respondents answered on the impacts of construction accidents toward construction company

3.2.5 Common Perspectives between Construction Companies

To further comprehend the respondents' perspectives, the variables under the awareness towards safety and health in construction companies, factors contributing to the construction accidents in construction site, barrier of the implementation of OSH programme and impacts of construction accidents towards construction company were analysed with two different groups. The questionnaire responses were received from 58 of G1-G6 and 58 of G7 contractor companies respectively. Therefore, the grouping for variables is the contractor grade; G1-G6 group and G7 group. The variables were the 10 factors that contributed to the construction accidents and 7 barriers of the implementation of OSH practices on construction industry were analysed with two different groups with Levene's test and Kruskal-Wallis test. Levene's test is used to investigate whether the consistency varies for each variable; it measures the equality of the variance. If p-value is less than 0.05 in the Levene's test, the equal variance cannot be assumed, vice versa. There was homogeneity of variances for failure to recognize safety hazards, attitudes towards not wearing PPE, and lack of safety knowledge and training; and barriers: lack of awareness of OSH relevance by workers, inadequate OSH policy and dedication of time, and prioritisation of production over safety (Table 3.5). Since Levene's test results showed these variables are homogeneity of variances, to statistically explore whether the two groups perform significantly different, One-way ANOVA analysis, Kruskal-Wallis test was applied to compare mean scores between the two different groups as classified earlier.

The Kruskal-Wallis test indicated the means of the two groups are equal towards the variables as the variable with p-value was more than the critical value of significance of 0.05. When the p-value is less than the critical significance of 0.05, it means the equal variance cannot be assumed, or vice versa. Therefore, the variables with p-value more than 0.05 were having the similar viewpoint of agreement for the variables statistically. There was homogeneity of variances for the variables in Table 5. The findings indicated there is no significant difference between both groups.

There was homogeneity of variances for barriers of implementation of OSH programme

in construction sites, the finding shows no significant difference between two groups. Since the Levene's test results showed these barriers are homogeneity of variances, the Kruskal-Wallis test for lack of awareness of OSH relevance by workers, inadequate OSH policy, inadequate dedication of time, and prioritisation of production over safety.

The respondents from different contractors' grades showed similar perspectives towards the current safety and health practices and the critical factors that contributed to construction accidents as well as the critical barriers to implementing safety related programmes on sites. The attitudes toward not wearing PPE and lack of safety training are the critical factors in most of the construction sites; this might be due to the respondents' companies prioritising production over safety. In developing countries, the implementation of safety and health programmes is a challenge under the condition of insufficient resources such as tight project schedules and limited budget allocation for safety and health programmes.

There was homogeneity of variances for impacts of construction accidents towards construction companies, and the finding shows no significant difference between two groups for cost overrun, damages to the company financial stability, damages to the company's reputation, delay of construction project completion. Since Levene's test results showed the four impacts are homogeneity of variances, the Kruskal-Wallis test for these impacts. When the p-value is less than the critical significance of 0.05, it means the equal variance cannot be assumed. The impacts of lost confidence among stakeholders and workforce ($F=15.8174$, $p < 0.05$), penalties from the relevant authorities ($F=7.8611$, $p < 0.05$), and dissatisfaction from public ($F=25.1988$, $p < 0.05$) showed slightly significant difference between the two groups. Overall, the results are generally recognizable by the respondents' perspectives regardless of the size of the company.

Table 3.5: Similarities of perspectives between both groups

Factors contributed to construction accidents		Levene's Test for Equality of Variances			One-way analysis of variance - Kruskal-Wallis test	
		Mean	F value	p-value	chi-square	p-value
Failure to recognize safety hazards	below G7	4.69	3.5633	0.0616	3.6046	0.0576
	G7	4.81				
Attitudes towards not wearing PPE	below G7	4.81	3.0829	0.0818	1.5789	0.2089
	G7	4.88				
Lack of safety knowledge and training	below G7	4.79	0.5209	0.472	0.4489	0.5029
	G7	4.83				
Barriers of implementation safety practices						
Lack of awareness of OSH relevance by workers	below G7	4.57	3.5395	0.0625	0.6818	0.409
	G7	4.66				
Inadequate OSH policy	below G7	4.41	2.3546	0.1277	0.4948	0.4818
	G7	4.43				
Inadequate dedication of time	below G7	4.74	3.2742	0.073	0.4444	0.505
	G7	4.66				
Prioritisation of production over safety	below G7	4.81	0.0319	0.8586	0.4273	0.5133
	G7	4.83				

3.3 Conclusion

In this study, the current status of safety and health issues at construction sites in Malaysia has been clarified through a questionnaire conducted on managers and other related persons at construction sites in order to understand the employment status of foreign workers, their approach to safety and health management, and their awareness of safety and health issues. The results showed that most of the companies responded prefer to employ young foreign workers from neighbouring countries, but are not satisfied with the working attitude of them due to their poor communication skills. Although most of the companies that responded have made their safety and health policies known to all employees, established internal safety and health departments, and conducted safety and health activities such as toolbox meetings and regular safety and health training, the respondents considered the implementation of the current construction safety activities to be inadequate. The possibility was ascertained that the implementation of the current construction safety activities does not meet the needs of construction site employees. The findings showed that the respondents tended to be aware that the construction site

accidents affect workers and their own behaviour, the site environment is an obstacle to OSH programme and that construction site accidents affect project and company profits, which is a common perspective regardless of size of the company. These problems at construction sites can be interpreted as improving communication with foreign workers, enhancing the content of safety and health education, and being aware of good relationships with stakeholders.

As a conclusion, a quantitative approach identified the current safety and health practices from the perspective of construction site personnel. The analysis results concluded the following points: 1) Majority of the construction sites are constituting by foreign workers especially from these neighbourhood countries that causes poor communication problem due to different languages, 2) Most of the construction companies are aware of safety and health policy and own their in-house safety and health department, 3) The site personnel claimed that the current safety and health activities for foreign workers were not sufficient due to lack of resources and budget allocation for safety, 4) Attitude toward not wearing PPE and lack of safety knowledge and training were identified as the critical factors contributed to the construction accidents, 5) Lack of budget allocation and prioritisation of production over safety were determined as the critical barriers to implement OSH practices on construction sites. Statistically, there is no significant difference of perspectives found between below G7 and G7 companies in the current safety and health practices on construction sites and the variables. The findings could contribute a comprehensive view on current safety and health issues to provide useful references for further effective safety precautions and to enhance the construction sites safety environment in Malaysia. The summary of the main points will contribute to improving the environment of construction sites in Malaysia.

Chapter 4 Differences of Occupational Safety and Health Practices and Accident Prevention Methods in Malaysia and Japan

The guidelines related to the occupational safety and health in construction safety management in Japan and Malaysia were further compared to provide an overview on the current construction site safety practices in both nations. To address the research gaps, an investigation was to exemplify the current situation of construction safety and health related issues in Malaysian context which eventually could initiate to enhance knowledge among construction stakeholders and figure out various effective solutions to solve the current issues. The chapter aims to determine the changes in the safety measures in the construction industry based on the construction accident trends in Japan and Malaysia, and to determine the barriers to implementing OSH practices on construction sites in Malaysian context; to identify the differences of OSH measures in the Japanese and Malaysian construction industry. There are clear differences from a micro perspective. In addition, the accident prevention methods in a safety-focused manner on construction sites in the Japanese construction industry and the construction site safety management system especially in dealing with foreign workforce on-sites were further explained in this chapter. To highlight the current scenarios of safety issues in Malaysian construction industry, the construction phenomena including the on-sites practices management were further explained with the aid of photographs for academic purposes.

4.1 Changes in the Safety Measures in Construction Industry based on Accident Trends in Japan and Malaysia

The safety culture is the fundamental pillar to improve and maintain the safety performance and awareness at construction sites (Fang and Wu, 2013; Ofori et al., 2013). Therefore, the differences between organisations are directly affecting the construction safety issues. Most of the countries are practising safety management systems (Ng and Mohd Idrus, 2021), yet, Malaysia showed low implementation of safety and health management practices (Manu et al., 2018). The existing measurement tool named Safety and Health Assessment System in Construction (SHASSIC) which was developed and managed by CIDB lacks concern project-wise such as implementation of audit and safety personnel (Abas et al., 2020). The periodic safety and health training for construction workers are not performed routinely as there is no such provision under the national legislative framework in developing countries (Sanni-Anibire et al., 2018). As a general rule, if the person being assessed demonstrated the required qualities, no further training should be needed (Guidelines OHSMS DOSH, 2017 pg.40). In addition, the safety and health management in the construction industry is considered poor in terms of budget allocation, lack of commitment, enforcement (Manu et al., 2018) and insufficient safety and health management involved with foreign workers (Cheng and Wu, 2013). On the other hand, the organisation prioritised production over safety in developing countries (Sanni-Anibire et al., 2018).

According to the Occupational Safety and Health Act (OSHA 514, 1994), the duty of a contractor is to ensure the safety, health and welfare at work for all the workers. Contractors are responsible to prepare and execute safety and health practices at work and notify it to all of his workers regardless of the type and size of the projects (Huang and Hinze, 2006), and ensure that all staffs are certain about their safety and health responsibilities (Zin and Ismail, 2012). By understanding the importance of construction safety to the projects and company's reputation, contractors should establish construction safety and health practices to protect all the workers by enhancing the safety awareness to reduce the accidents. In addition, mandatory safety programme for all workers have been shown to be effective in improving workers' knowledge, skills and attitudes

(Fardaniah et al., 2018), lead to reduce accident rates effectively and in directive enhance the safety and health in the working environment (Yiu et al., 2019). However, construction companies might overlook the importance of safety and health issues and reduce attention to safety and health when company's profits decline, or due the limitation of resources such as allocation of budget manpower and time (Hallowell and Gambatese, 2010; Taufek et al., 2016). In such cases, the construction companies rather pay attention to the project completion on time and control the cost not to overrun instead of safety and health issues. Some contractors thought the construction safety and health knowledge can be gained from working experiences where safety programmes are worthless.

The construction safety and health management programs must be specific, monitored and enforced to improve the safety and health in construction sites (Smallwood, 2017). Management commitment is affecting the implementation of construction safety policies (Priyadarshani et al., 2013), it is vital to create and maintain a safe work environment with both the commitment of management and workers (Ayob et al., 2018). In Japan, the Ministry of Health, Labour and Welfare promulgated the Guidelines for the Safety Management of Construction Sites by the principal contractor which set out the policy for safety management at construction company branches and construction sites in 1995 (Construction site safety management guidelines by the former business operator) (JISHA, 2021).

The guidelines list 13 safety management programs to be undertaken by contractor at construction sites as followed: develop a safety and health management plan; improve excessive multi-layer subcontracting; clarification of who implements occupational accident prevention measures in the contract and who bears the costs of such measures; identification of the contractors concerned and their workers by the principal contractor; preparation of work procedure manual for subcontractors; establishment and operation of occupational accident prevention councils; setting up and running meetings for communication and coordination between operations; patrol the work area at least once a day; education of new workers; disseminating the contents of meetings of the Industrial Accident Prevention Council and other bodies to new subcontractors; instructing subcontractors to hold a safety and health meeting every morning before work starts and

to hold a toolbox meeting; implementation of safety construction cycle activities; and establishment of a foremen's association. The impact of construction accident reduction attributed to these comprehensive programs signals that a long-term effort at the national level acts as an effective stimulus for safety and health improvement in Japan.

4.1.1 Safety Training on Current Safety Management System in Construction Industry in Japan and Malaysia

Skilled Training System for Foreigners in Japan

Japan is expanding its technical education system to ensure that overseas workers will want to work in Japan in the future. The foreign workers as known as technical intern trainee and all the foreign workers are compulsory to undergo the skill training system stipulated by the Act on Proper Implementation of Technical Intern Training for Foreigners and Protection of Technical Intern Trainees (Technical Intern Training Law) enforced in 2017 to further strengthening and protecting technical intern trainees and conducting appropriate training to acquire skills. The training period is 5 years, and the acquisition of skills is carried out based on the technical intern training plan. The types of jobs and works covered by the system are stipulated by Ministry of Health, Labour and Welfare while the Japan International Training and Skilled Worker Cooperation Organisation (JITCO) as a training institution has categorised the construction related into 33 operations in 22 job categories including scaffolding building work, framing construction work, tile-roofing work and etc. for the foreign technical intern training system to strengthen the safety management and protect technical intern trainees (JITCO, 2021; OTIT, 2021). The safety regulatory enforcement requirements and practices at the workplace are able to reduce the non-fatal work-related accidents (Adinegara et al., 2011). The current rules and regulations stipulated by the Japanese construction industry aid to provide regular education among the construction workers to continue to shape the index of safety at the construction sites. The improvement made by Japan shows a very encouraging and effective decline to be used as a model to reduce the occurrence of accidents in Malaysia construction sites.

4.2 Barriers of the Implementation of Safety Training Program in Malaysian Context

The concept of design for safety was introduced to minimise the risk of accidents and ill health through the consideration of hazards during upstream design phases of a construction project with the consideration of construction workers, who are usually the victims of construction accidents (Larsen and Whyte, 2013); and there had been significant studies to support the importance of improving site safety and health through elimination and mitigation of hazards during design (Gangoellis et al., 2010; Larsen and Whyte, 2013). Meanwhile, insufficient safety measures are not only a safety issue but lead to a significant impact on the construction companies' financials by increasing construction cost up to 15% (Aminbakhsh et al., 2013). However, various challenges are still remaining unsolved especially during the construction process as this is the most complex part of the value chain with the involvement of a variety of disciplines and functions. The problems will remain growing without a proper effort from the stakeholders to reduce the number of accidents.

In the striving for safety and health excellence as captured by headlines such as 'One death is too many' (Donaghy, 2009), there is a responsibility on contractors to go beyond compliance with regulatory requirements to proactively develop and implement measures that will prevent unfavourable safety and health outcomes (Liang et al., 2021). Apart from the regulatory requirements, there is however a dearth of insight as to the in-house measures/practices implemented by main contractors to address this phenomenon (Manu et al., 2013). Most contractors see their health and safety plans, which must include full sets of risk assessment, as merely a burdensome requirement that they must fulfil in order to avoid government fines. As a result, they often neglect the proper implementation of these plans (Saurin et al., 2008).

Construction is often perceived as a backward industry and the needs for change are highlighted in government and authorities reports especially safety and health issues. According to the investigation from DOSH, the majority of the incident demonstrates the lack of specific knowledge and skills to prevent occupational accidents; it also provides

lessons for employers and top management to be aware of complying with the government's laws, rules and regulations. Nevertheless, there are some employers that are still unconvinced about the importance of OSH's practices (Fardaniah et al., 2018), and some contractors are not investing sufficient in safety and health at the workplace due to the cost factor.

Besides causing human tragedy, construction accidents also delay project progress, increase costs, and damage the reputation of the contractors (Wang et al., 2006). Construction accidents and injuries bring direct and indirect expenses. Direct expenses include medical costs and workers' compensation insurance; while indirect expenses contain delay in construction progress, worker's motivation diminishing, and adverse effects on reputation of the construction companies (Wang et al., 2006; Mahmoudi et al., 2014). With the increasing costs of accidents, professionals have realised that even one accident might bankrupt the company due to the lawsuits and claims against the owner (Alpmen, 2013). There is no in-depth study on contractor performance evaluation towards safety and health practices.

There are barriers that contribute to the implementation of OSH in the construction industry (Table 4.1). Researchers grouped barriers into four dimensions namely non-conductive work climate, poor governance, poor safety awareness, and unsupportive industry norms (Buniya et al., 2021). However, a governance system at national level is necessary to tackle these barriers and improve the safety performance in the construction industry (Buniya et al., 2021). The management needs to be responsible for the majority of the causes of OSH failures such as insufficient safety education, inappropriate training, poor housekeeping, and employees' attitude that acting as a major part in safety on site. A strong safety culture support by the policy within a company consists of the participation of all employees from different positions and levels of occupational safety and health involvement; with a comprehensive occupational safety and health policy that consists of clear rewards and punishments for performance system able to provide a good direction to the employees (Hasan and Jha, 2013). However, inadequate occupational safety and health policy would increase the risk for more hazards. From the standpoint of construction companies, the major problems of limitation of resources such as allocation

of budget manpower, time and the awareness issues for OSH programme implementation have remained unsolved (Taufek et al., 2016). The construction company is less likely to implement the safety and health programme due to priority of project completion with minimum costs (Buniya et al., 2021). Studies show that the safety and health programme lead to reduce accident rates effectively and in directive enhance the safety and health in the working environment (Yiu et al., 2019). By enforcing the safety and health policy including to have more regular site inspections, increase the fines amount for offenders, with the rules and regulations can lead to a better safety and health implementation (Swuste et al., 2012), enhance the image and reputation of the construction (Ju et al., 2018).

From the standpoint of construction companies, the major problems of limitation of resources such as allocation of budget manpower, time and the awareness issues for OSH programme implementation have remained unsolved (Taufek et al., 2016). The construction company is less likely to implement the safety and health programme due to priority of project completion with minimum costs (Buniya et al., 2021). Nevertheless, lack of technical support by consultants (Yiu et al., 2018), lack of awareness of OSH relevance by workers (Yiu et al., 2018), inadequate OSH policy (Gurmu, 2019), inadequate dedication of time (Goh and Chua, 2013), lack of effective communication (Ismail et al., 2018), prioritisation of production over safety (Kogi, 2002), lack of budget allocation for OSH programme (Goh and Chua, 2013) are considered as the barriers of implementation of OSH programme in construction companies. Studies show that the safety and health programme lead to reduce accident rates effectively and in directive enhance the safety and health in the working environment (Yiu et al., 2019). By enforcing the safety and health policy including to have more regular site inspections, increase the fines amount for offenders, with the rules and regulations can lead to a better safety and health implementation (Swuste et al., 2012), enhance the image and reputation of the construction (Ju et al., 2018).

Table 4.1: Barriers of OSH implementation in construction industry

Barriers of OSH implementation in Construction Industry	References
Lack of technical support by consultants Lack of awareness of OSH relevance by workers Inadequate dedication of time Inadequate OSH policy Lack of effective communication Prioritisation of production over safety Lack of budget allocation for OSH programme	(Yiu et al., 2018; Mellor et al., 2011) (Yoon et al., 2013; Buniya et al., 2021) (Yiu et al., 2018; Buniya et al., 2021) (Goh and Chua, 2013; Gurmu, 2019) (Ismail et al., 2018; Gurmu, 2019) (Kogi, 2002; Ismail et al., 2018; Buniya et al., 2021) (Kogi, 2002; Goh and Chua, 2013; Buniya et al., 2021)

4.3 Differences of OSH Measures in Japanese and Malaysian Construction Industry

From the previous chapters that discovered the similarities and differences on the construction safety and health related issues between both nations, the following Table 4.2 shows the summary on the comparison elements between both nations.

Table 4.2: Summary on the comparison elements between both nations

Description	Japan	Malaysia
Current construction accident trends	The casualties steadily declined after 1972; continuously remained at low level until present.	No significant reduction in construction casualties, with signs of increasing fatalities.
Major construction fatalities	Fall from height, struck, crushed and hit by, collapse, buried	
Occupational safety and health Act and its purpose	JISHA 1972 to secure the workers' safety and health in the workplace; to create a comfortable work environment. (Stated in Article 1)	OSHA 1994 to secure the safety, health, and welfare of workers at the workplace.
Laws and guidelines governing construction towards fall protection	More specific is the type of safety body harness and the circumstances in which it needs to be worn. Construction workers are compulsory to wear full harness safety belts to replace the torso belt type of safety belt in workplace (over 5 metres high) started from 2022 (Safety and Health Law Enforcement Regulations)	General information on safe harness; the circumstances in which it needs to be worn is not specified. Construction workers must use protective equipment all time provided by employers (OSHA 1994) and the body safety harness manufactured must be equivalent with national or international standard use for working at height (CIS 15:2019).
Countermeasures against falls from Scaffolding	The rule that a qualified person/scaffolders must perform the work is similar	
	Both passive preventive and proactive measures have been implemented, such as the promotion of handrail-first erection methods.	Basic passive precautions were implemented, such as the installation of vertical and horizontal body lifelines and temporary guardrails as edge protection.
Qualification of construction works based on ILO-OSH-2001	The COHSMS guidelines are fully compliant with international standards and have been re-edited to suit the construction industry.	Guidelines OSHMS compliant with international standards, it does not include health and safety goals in it.
Guidelines for Principal Contractor	An established of 16 clear elementary needs for principal contractor at construction sites stated in Section 5 of COHSMS Guidelines	A brief guidance to principal contractor stated in paragraph 92-114 under the guidelines of OSH in construction industry (management) 2017
Safety Management	The overall safety and health manager must be the	The main contractor must employ a SHO or SSS

Organisation on Construction Sites	same person who controls the overall execution of the construction site. All subcontractors are responsible for the safety of their own contracted work. The subcontractors must appoint a person in-charge for safety; no special qualifications or certifications are required to fulfil these roles.	to manage safety matters in relation to the workplace, including all trades on the construction site. The SHO / SSS must be registered with DOSH and possess such qualifications or receive training/courses recognized by the Ministry of Human Resources /DOSH.
The requirement to establish of safety committee at workplace	The requirement of the safety committee is specified such as the members to join the committee.	The requirement of such a safety committee is not specified.
Safety Management Programme on construction sites	The guidelines list out 13 safety management programmes to be undertaken by contractors at construction sites. The sub-contractor's SHO and chief engineer are often concurrently held by the foreman and he must be a person who directly guides or supervises workers in operations (Article 60 in Industrial Safety and Health Act). The main contractor is required to provide education on the contents of Article 40 of the Industrial Safety and Health Regulations to new foreman.	The guidelines do not list out safety management programmes to be undertaken by contractors at construction sites. The periodic safety and health training for construction workers are not mandatory. There is a lack of safety performance measurement in the Malaysian construction industry.
Skilled Training System for foreign workers	Mandatory.	Not mandatory.

4.4 Discussion

The 10-year average of construction fatalities as a proportion of all industries is similar for Malaysia (37.14%) and Japan (33.22%) between 2011-2020. However, while the proportion in Japan has remained stable, the proportion in Malaysia has fluctuated considerably. Data shows that the ratio of casualties to all industries in Malaysia is about one-third of that in Japan. This means that the ratio of fatalities to casualties is higher in Malaysia than in Japan (however, this does not consider the difference in the system for reporting injuries to the authorities). From these facts, we can infer that the construction safety environment in Malaysia may be inferior to that in Japan in terms of management. From the above elaboration of the safety related regulations and practical issues, the authors would like to give a macro perspective and a micro perspective of safety in the construction industry between both nations.

Fall from height is one of the critical fatal construction accidents in developed countries and developing countries (Evanoff et al., 2016; Nadhim et al., 2016; Umer et al., 2018; Abukhashabah et al., 2020) that bring impacts to humanitarian, economic and legal issues (Muhamad Zaini et al., 2020). Fall from height accounted for approximately 40% of all fatal accident types between Japan and Malaysia, while the percentages of the other accident categories were not significantly different between both countries. To address

the construction accidents, institutionally, both countries formulated laws and regulations of safe use scaffolding including the use of full body harness; guidelines for construction occupational health and safety management systems have been issued; health and safety officers are required to be on duty on construction sites; also, there is an obligation to establish safety and health committees if a certain number of employees are engaged on a construction site. However, with the shortage of manpower due to economic development, for example, the ageing problem in Japan and the excessive number of unskilled workers in Malaysia, both countries have an increasing number of foreign workers working on construction sites, with this safety and health education has become an issue in recent years. Therefore, from a macro perspective, there is no significant difference between Japan and Malaysia in terms of the occupational safety environment on construction sites.

The types of fatal accidents on construction sites and the regulations relating to accident prevention are similar between both nations, but fatalities in the construction industry are still not eliminated, which might be due to the differences in the respective national conditions. Nevertheless, focusing on a micro perspective reveals a different situation. Japan has regulations not only on the wearing of full body harnesses but also on the height at which they should be used, Malaysia has not specified the height on the use of full body harness on site. However, the obligation to wear harness-type safety belts was much earlier in Malaysia than in Japan. Both countries' occupational health and safety management systems for the construction industry indicate the role and responsibility of the prime contractor for prohibited items, but Japan imposes on the prime contractor the development of safety management goals and plans in addition to those items. Japan has revised the regulations by reviewing the existing problems to take proactive precaution measures, for instance, the concept of handrail-first erection method is used in Japanese construction to prevent fall from scaffolding. The COHSMS guidelines appear comprehensive and complete for Japanese contractors to implement for their projects. Malaysia did follow the international standards guideline, yet the industry players show less self-initiative, and it appears to have fewer "tailor-made" guidelines to suit the construction industry.

In terms of requirement of construction safety personnel, both nations provided a

definition and qualification in the regulations, however, the JISHA 1972 provided more specific qualification (Chapter 3) than in OSHA 1994 Malaysia. The contractors employ CIDB-certified personnel to ensure the safety of all trades on their projects in Malaysia construction sites; while in Japan, the director of construction projects acts as the safety and health manager, and the construction management leader is responsible for the execution of health and safety management at the construction site. Regarding the establishment of a safety and health committee on site, Japan has specified details on the number and membership of the committee, the committees will report accidents after patrolling and observation on-site and provide appropriate measures to prevent the recurrence of accidents and prevent potential accidents occurring on site after discussion, yet Malaysia does not specify requirements for the committees.

Japan provides education on the knowledge required for technical training at construction sites, including language skills. Safety training and education to construction workers, including foreign workers, is mandatory in the Japanese construction industry, such as providing education to newcomers and implementation of safety work cycle activities to continuously educate the workers, especially the ongoing growth of foreign workers involved in the industry. The skilled training system for foreign workers aid to provide skills and proper education for the workers to continue shaping their safety awareness, to protect themselves from accidental injuries. Contractors in Malaysia do not mandate any special training for foreign workers working on construction sites. In contrast, these programmes are a waste of resources and a drain in the eyes of contractors in the Malaysian construction industry.

From the above elaboration, there are clear differences from a micro perspective. The difference is that Malaysia has only institutionalised “roles and responsibilities” while Japan has established a “code of conduct” in addition to this. Establishing a code of conduct not only increases the level of implementation of safety management activities, but also allows workers to judge whether their actions are good or bad based on clear criteria. We assume that the steady decrease in the number of victims in Japan is due to the design of the system referring to behaviour. This study clarified the differences between the construction safety environment in Japan and Malaysia by focusing on laws and systems. In the future, we plan to clarify the influence of the code of conduct on safety

and health activities at construction sites through a survey of actual conditions at construction sites.

The current rules and regulations stipulated by the Japanese construction industry aid to provide regular education among the construction workers to continue to shape the index of safety at the construction sites. Therefore, strengthening and promoting safety training and education for construction workers is one of the most effective solutions to reduce accidents in the long-term and to reduce the disparity in construction accidents between developing and developed countries. The improvement made by Japan shows a very encouraging and effective decline to be used as a model to reduce the occurrence of accidents in Malaysia construction sites. Certain approaches implemented in Japan can be considered in the Malaysian circumstance. To be specific, the Malaysian government should encourage contractors' spontaneity towards safety and health in construction sites; the safety and health related training for construction workers and foreign workers are urged to be mandatory by contractors. Given the implication of safety and health management in addressing the related construction safety and health issues in the Japanese construction industry, take effective measures to confront problems and implement effective solutions. This is a useful example for Malaysia and other countries that desire to reduce industrial accidents and raise the awareness of workers safety. The Malaysian construction industry has had to strengthen the existing regulations, perhaps using the example of Japanese safety prevention measures, to prevent construction accidents from occurring. Japan attached a great and comprehensive safety management programme stipulating the act to reduce the construction accidents effectively. There is no doubt that Japan is a good example to learn from.

4.5 Accident Prevention Methods in Japanese Construction Industry

To further find out the safety practices on accident prevention methods, the author visited several Japanese construction companies and their construction project sites to identify the actual safety practices and the safety culture on site. This chapter mainly focuses on the safety and health issues in the construction industry by investigating the current in-house practices/measures of main contractors implemented to address the safety and

health influence with the intention of obtaining several perspectives as to other mechanisms which could complement the mitigation offered by the regulations. Also, this study will further look into the deficiencies of the current construction safety and health practices in Malaysian context in order to overcome the shortcoming from the safety related issues.

4.5.1 Japanese Construction Site Safety Management System

In Japan, the employer must take necessary measures to prevent industrial accidents arising from the work actions or behaviours of workers (article 24 in JSHA 1972). In this part, the construction site safety management practices in Japanese construction sites covers the Plan-Do-Check-Act (PDCA) cycle, the implementation of safety work cycle, risk assessment *Kiken Yochi* (KY) meeting, safety meeting schedule including daily, weekly and monthly basis, the responsibilities of contractor and subcontractors, safety education for newcomers, the documentation on safety procedures on sites, disasters and accident cases updates (Accident calendars board), on-site communication tools for safety concerns, and the approaches towards safety and health management from the visited corporations.

Plan, Do, Check, Act (PDCA)

The construction companies in Japan implemented the management framework, Plan, Do, Check and Act cycle (PDCA) that recognized and compliance of safety standards to help the company attain a better implementation performance. The PDCA acts as a strategy tool to provide an effective approach for problem solving and manage changes with the characters of continuous loop of planning, doing, checking and acting. Most of the construction sites implement their safe work cycle in-line with the PDCA framework. In Corp. B, the safe work cycle implemented in construction sites includes five cycles starting from the innermost cycle namely daily safe work cycle, occasional safe work cycle, weekly safe work cycle, monthly safe work cycle, and the outermost cycle, entire

work safe cycle (Figure 4.1).

The activities included in the daily safe work cycle are: construction review meeting, morning assembly and warm-up exercises, danger prediction activity, pre-start inspection, inspection and guidance, safety process meeting (coordination and adjustment between trades), inspection, observation and guidance, clean up, and report on the working conditions.

The activities in the occasional safe work cycle are construction review meeting, preliminary review meeting for dangerous work, publicity meeting, medical health check-up, send-out education, newcomer education, blood pressure measurement, fire prevention and evacuation drills. However, the activities such as newcomer education and blood pressure checking can be conducted daily depending on the numbers of newcomers joining the site.

The activities for weekly safe work cycle are construction review meeting, simultaneous cleaning on site (daily sorting, tidying up and cleaning up are the basics), weekly process meeting (coordination and adjustment between trades); while for monthly safe work cycle include the activities such as construction review meeting, monthly safety and health management plan, disaster prevention meeting, voluntary site patrol, monthly inspection, foreman meeting and safety assembly. The entire safe work cycle includes the review meeting, workplace safety and health management plan and system audit to ensure the safe work cycle is better performance.

The construction review meetings are vital as it will be conducted at the first place for all the cycles to achieve clear understanding of the entire work among all workers on site.

The activities such as danger prediction, sending out education, body medical check-up, newcomer education, clean up, foreman meeting and voluntary site patrol are the responsibility of the sub-contractors.

From the above, all the cycles are seamlessly connected to each other, it is vital to understand each of the activities with its purposes among the workers.

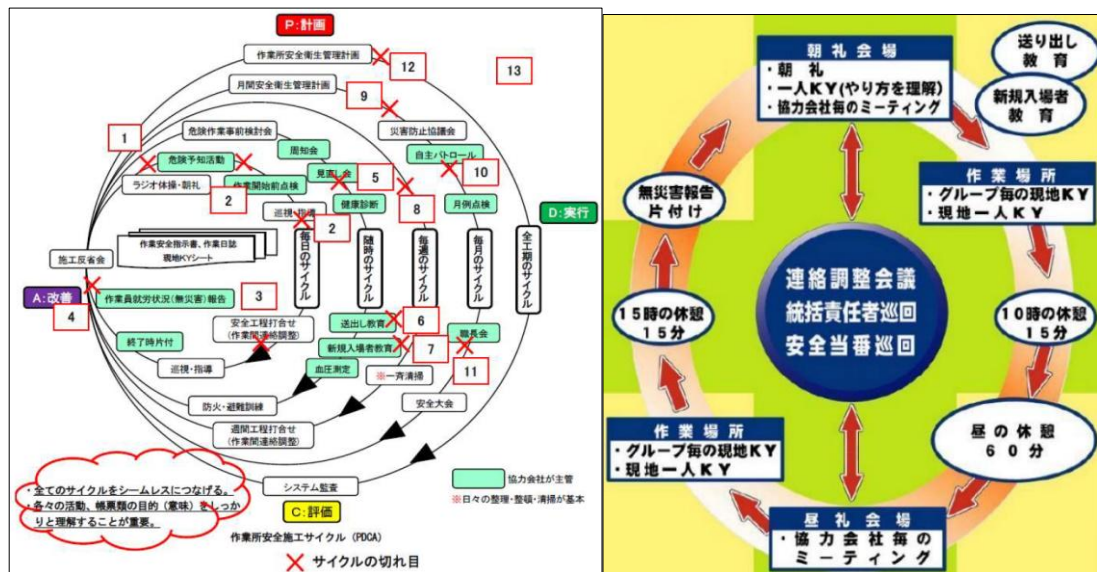


Figure 4.1: Safe Work Cycle in Corp. B (information provided by the site in-charge person)

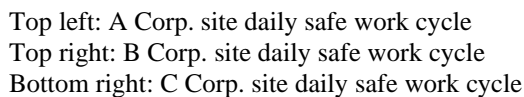
The author and colleagues joined in the morning assembly with the workers at C Corp. job sites. The purpose of the morning assembly is to prepare for work, to inform workers about the rules and adjustments of the day such as the day's event, danger points, routes etc., warm-up exercises, with these to bring a feeling of togetherness among all workers and site persons. The warm-up exercises session is a daily routine that has been practised in most of the construction sites in Japan, it aims to enhance the communication and relationship among workers, and to ensure body health condition or to inform superiors that they are unwell and need to rest, etc. In the C Corp. job site, the warm-up exercises were demonstrated through the monitors with audio and music in the workers' restroom (Figure 4.2). Besides, the corporation created corporate videos in Japanese language only (drama styles), customised according to the recent work tasks and seasons, repeated daily on the screens to remind all workers regards safe work.



Figure 4.2: Warm-up exercises in workers' restroom at C Corp. site

Safe Work Cycle

In the construction industry, the multi-layered sub-contracting structure is common, yet which has led to a complex sub-contracting structure, labour and safety issues, especially when involved with a complexity building project. The safety management for safety and hygiene of the site is compulsory to be carried on daily, weekly and monthly basis throughout the entire process by everyone on site. Therefore, the implementation of the daily Safe Work Cycle (SWS) is the core of the Japanese construction site safety as it is to be carried on daily, weekly, monthly bases throughout the entire process by everyone onsite. The purposes of the Safe Work Cycle as follow: to unite the construction safety and hygiene among all workers, to motivate sub-contractors' active actions for safety and hygiene management, to familiarise the safety and health activities among workers, to stimulate the creation of incentive ideas, and to ease the relationship between sub-contractors specially to clarify the responsibilities respectively. The Safe Work Cycle emphasises on the rest time between the operation hours to ensure the workers are in good mental and physical condition (Figure 4.3).



The warm-up exercises session is a daily routine that has been practised in most of the construction sites in Japan, it aims to enhance the communication and relationship among workers, and to ensure body health condition or to inform superiors that they are unwell and need to rest, etc.

The first general safety meeting of the day was held after the morning warmup exercises at the assembly point. The general safety meeting held by the general contractor to brief through the safety procedures and precautions to all the workers and staff, will last about 15-30 minutes, depending on the company's arrangement. Each subcontractor gathers their workers to carry out their own tailor safety meeting and program after the general meeting. In Japanese construction sites, maintaining safety working practices is the primary goal of every individual including subcontractors and all workers. The general outline of daily safety meeting of typical construction site:

7:30-8:00 A.M. General meeting to all workers and staff, site safety procedures briefing prepared and given by the general contractor. The use of PowerPoint Presentation slides and videos are common for such meetings. The content of the safety briefing including:

- i) Site rules and regulations
- ii) Explain the site conditions
 - a. Working station/location by trades with working time,
 - b. Information about the changes in schedule (if any),
 - c. Changing workstations of sub-contractors,
 - d. Heavy vehicles/machinery schedules, routes and stations,
 - e. Prohibited and restricted areas,
 - f. Loading and unloading areas and time,
 - g. Highlights of the issues found from sites
- iii) The work progress of the entire project and the project schedule
- iv) Other safety information
 - a. Heatstroke issue (during summer), keep warm during cold weather
 - b. Smoking areas
 - c. Lifting operation manual (to avoid blind spot)
 - d. Work at high-risk areas (get permission and supervision)

- e. Usage of tools and machinery
- f. Usage of dangerous materials (flammable)
- g. Keep clean and tidy on the access and egress routes

8:00-8:20 A.M. Toolbox meeting held with sub-contractors. Sub-contractors would brief the safety precautions and procedures to their workers in detail at their working station before starting work. Workers are required to jot down the details of safety procedures in a booklet “on-site hazardous work contents”, including the level of danger, safety prevention matters, countermeasures, and the contents must be cross-check by the sub-contractors and general contractor before start work. The risk prediction activity takes about 3-5 minutes to explain the risk and danger, how to prevent it and lastly with a mental support (spiritual shouting) among the workers.

9:00 A.M. Safety Education for newcomers

9:00 A.M.-11:00 A.M. Site patrol to check on workers’ arrangement and make sure workers follow the working plans and safety rules, point out the issues if the workers are doing work unsafe to eliminate unsafe behaviours and habits on the spot. Besides, the inspectors check on the condition of scaffolding, machines and remove unsafe materials and eliminate the rapping work on site. Check on measures toward the weather and climate is one of the purposes.

11:00 A.M. Review of specific safety concerns and procedures with specific groups of workers and/ or sub-contractors.

11:30 A.M. Discuss and brief about the safety procedures and site arrangement for the next working day with the specific groups of workers and / or subcontractors.

4:00 P.M. Discuss and brief about the safety procedures and site arrangement for the day after the next working day with the specific groups of workers and / or subcontractors.

Weekly and Monthly Meeting

In terms of weekly and monthly safety meetings, it consists of reviewing the upcoming week’s activities and discussing the potential safety concerns for the week among all the foreman, conducting an inspection of all heavy equipment and vehicles on sites, all temporary structures, and all materials storage areas. In addition, the monthly meeting

includes reviewing the proposed activity for the month and discussing safety concerns and potential safety hazards, inspection on temporary wiring systems, explanation of company safety concerns and safety goals to all foreman on the job and review all recent accidents and injuries with all personnel.

It is very much worth emphasising that there are warm-up exercises at the beginning of the morning assembly meeting; at the end of each meeting, there is a spiritual shout out to close the meeting. All these activities can reflect a spiritual bonding among all the workers from different companies and backgrounds. Constantly reminding workers and employees to take note of the safety concerns, related safety precautions, wear PPE and work safely leads to a safety culture that is directly proportional to the success of the safety program on site.

Contractors' and Subcontractors' Responsibilities

The organisation chart of general contractors and subcontractors' representatives with profile photo and names, and their responsive trades are shown on the announcement board. It will change and update with the work process. Sub-contractors involved in the project must be aware of the safety issues and take initiative during the operation to build and maintain the safety culture on sites.

The responsibility for maintaining safety is well communicated among co-workers via safety meetings. By then, each sub-contractor's representatives or foreman in different trades are responsible to record the daily safety measures on the on-site KY logbook a day before or in the early morning and obtain approval from the general contractor, present it on the KY notice board accordingly (Figure 4.4). The on-site KY logbook includes the sub-contractors' information, the works involved with contents, the number of workers, the date, the working hours, the types of dangers or the possible risks, indicate the degree of risk, and the mitigation measures towards the danger of the works (Figure 4.5). The general contractor will check through the logbook and give instructions and approve it.

In A Corp. site, the sub-contractors provide the safety booklet consisting of the on-site hazardous operation contents, to request the workers to record the hazardous contents and

report to his superiors before starting work. The inclusion of a list of hazards will increase workers' awareness of the concept of hazards and safety during the operation to prevent accidents.

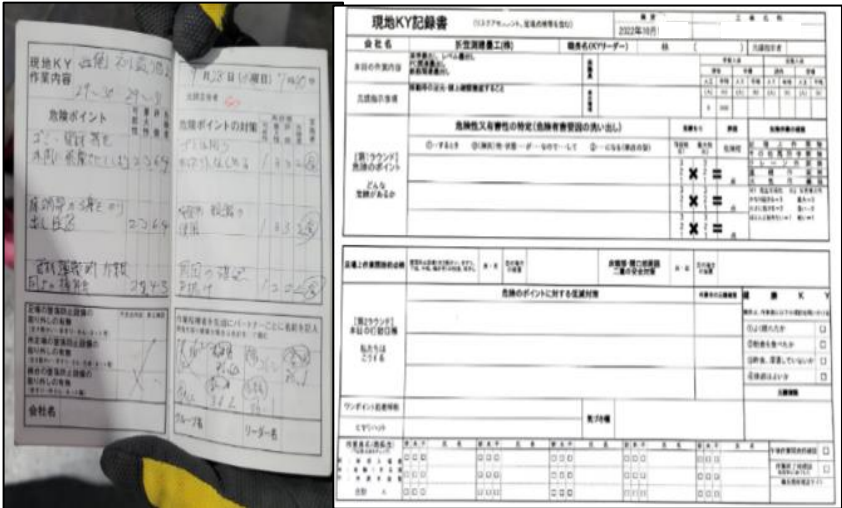


Figure 4.4: KY logbook from A Corp. site (left) and KY logbook (example) from B Corp. site



Figure 4.5: KY Notice Board at B Corp. site

Safety Education for Newcomers

The general contractors provided a safety education briefing to all the newcomers including foreign workers who reported himself on the first morning. The briefing method will be in verbal (mainly in Japanese language) and vision support with the use of

PowerPoint and videos to enhance the knowledge transfer. Basic health checks will be carried out to all newcomers such as blood pressure and body temperature before the safety education and assignment to the workplace. The newcomers' body condition will be recorded and documented for references (Figure 4.6).



Figure 4.6: Safety education to newcomers at B Corp. site; blood pressure measurement at A Corp. site

The safety education for newcomers includes the orientation and location of the building project, chain of command, safety rules and regulations, the routes to the entrances of the site, the adjacent buildings and infrastructures, the safety routes of the site and route for escaping, on-site configuration and facilities such as smoking areas and the Automated External Defibrillator (AED), the safe attire of work, the colour of the month for safety belt and wires (fall prevention system) (Figure 4.7), the tools that require permission to use, movement routes for heavy machinery and vehicles, safety precaution such as take note on the blind spots when lifting and sling operation, take note and double check of the use of appliances that can lead to fire hazards before and after operation, restriction areas, and the safe work cycle and etc.. The general contractors provide these safety education materials and information to sub-contractors to allow the sub-contractors to educate their new workers before the commencement of work.



Figure 4.7: the colour of the month for safety belt and fall prevention system and fire hazard prevention notice

Documentation on Safety Procedures

The safety manual and forms are prepared in the traditional method, in paper form that keep tidy in document storage cabinets labelled with names and related operations respectively. The documents are scrutinised and kept by the site personnel. These documents will be arranged neatly and visibly in the site office for monitoring, and discarded after the project has been completed. In Japanese construction sites, most of the workers and staff still prefer the paper mode that is able to communicate more quickly and effectively (Figure 4.8).



Figure 4.8: Cabinets with labels to store safety related documents on-sites

Sub-contractors involved in the project must be aware of the safety and take initiative during the operation to build and maintain the safety culture on sites. The organisation

chart of general contractors and subcontractors' representatives with profile photo and names, and their responsive trades are shown on the announcement board. It will change and update with the work process. These representatives will be one of the site safety committees on sites (Figure 4.9).



Figure 4.9: Organisation chart notice board at Corp. B's site (photos taken 14th Oct 2022)

The establishment of a site safety committee from subcontractors' representatives is not mandatory in the Act, but this is to take initiative to nurture a good safety practice on-site, this is to spread the responsibility while reinforcing the idea that maintaining construction safety on site is everyone's responsibility.

The responsibility for maintaining safety is well communicated among co-workers. By then, each sub-contractor's representatives or foreman are responsible to record the daily safety measures on the on-site KY logbook a day before or in the early morning and obtain approval from the general contractor, present it on the KY notice board. The on-site KY logbook includes the sub-contractors' information, the works involved with contents, the number of workers, the date, the working hours, the types of dangers or the possible risks, indicate the degree of risk, and the mitigation measures towards the danger of the works. The general contractor will check through the logbook and give instructions and approve it. The sub-contractors involved in different trades are required to record the works accordingly. Maintaining safety on site is the culture and core that must be maintained by all members.

Disasters and Accident Cases Updates

In Corp. A's site, the accident calendar is posted on the wall panel near to the site office that is visible to everyone who enters the site in order to raise the safety awareness on site. The accident calendar is created and updated by the site office after inspection or if there are any accidents occur on-site, each of the cases include the types of accidents with photos, the date of accident, the victim's particular information, the causes of accidents, conditions and specific countermeasures to enhance the safety awareness to avoid similar accidents in the future (Figure 4.10). The transparency of disasters and accidents updates on site is important to provide a realistic description of accidents and ways to prevent the accidents to give warning among workers.



Figure 4.10: Accident calendar posted on wall panel (Photos taken from Corp. A's site on 13th Oct 2022 by the author.)

On-site Communication Tools for Safety Concerns

Some general contractors such as corporation A and Corp. B, would provide a system for sub-contractors to apply for the usage of entrance or access by filling in the detailed information of the use of machine tools with schedule and routes. Corporation A owns a cloud system named *Karisma-Net* for safety information, discussion, issues etc. as for internal usage. The general contractor will provide a platform for all the sub-contractors for on-site communication purposes especially safety issues found from sites. The

platform such as *Gmail* chat with the use of portable devices is user-friendly for all foreman to communicate effectively during the work day. The general contractor carries out site inspection, takes photos as evidence and gives comments and instructions for safety concerns such as improper storage of materials on site, the related issues will be discussed and handled by related sub-contractors immediately after the safety meeting. The safety concerns in different locations within the site will be updated from time to time by general contractor and subcontractors' representatives via the given platform to maintain a good safety practice throughout the entire process.

Approaches towards Safety and Health Management: Corporation A

Most notably the main contractor is responsible for the safety of the entire site, however, subcontractors are responsible for the safety of their own workers. In order to obtain better communication for safety concerns equal sharing of risk during the operation. one of the oldest and largest construction companies in Japan, Cooperation A has implemented three (3) major approaches to tackle the construction safety issues meanwhile to maintain good safety practices on site. The approaches are guidelines to subcontractors and workers, guidance to the construction office and safety management using IT. The details of each approach as follow:

Table 4.3: Details of approaches

Approaches	Contents
Guidance to subcontractor and workers	<p>Suspension or stop work during irregular work or tasks</p> <ul style="list-style-type: none"> -To analyse the recent deaths and catastrophic events and unscheduled works or irregular works - The unreported work or machine repairs work, and irregular work as plans and manuals not listed in order or must be changed, to be reported during the morning assembly meeting or tool box meeting. - To conduct a risk assessment business plan, work procedures, local KY meeting if such stop work occurs. If the procedure manual is unavailable, stop working immediately.
	<p>3.3.3. The basics of sling work of <i>Gu-Pa</i> Campaign and 3.3.3. Campaign</p> <p>The <i>Gu-Pa</i> Campaign is the hand signals of showing the palm of the hand as “Stop” and or making a fist as “Ok” between the operators and person who attempt to enter or approaching the heavy-vehicle types construction machinery and vehicle type cargo handling equipment as part of the communication.</p> <p>-The 3.3.3. Campaign is to prevent accidents during slinging work with the concept of “<i>Tamagake Yoshi</i>”, “<i>Taihi Yoshi</i>”, and “<i>Jigiri Yoshi</i>”.</p>

	<p>- “<i>Tamagake Yoshi</i>”, to confirm for 3 seconds to check the load is balanced and hung properly. The crane operator follows the signals to stretch the slinging wire and let go of his hand before stretching. The rigger checks for the crushed core, centre of gravity, hoisting, wire alignment, packing, care rope, etc. for 3 seconds.</p> <p>- “<i>Taihi Yoshi</i>”, to carry out the sling, the rigger should be more than 3 metres away to get ready for shaking. To check the footsteps and evacuate, when lifting off the truck, get off the loading platform. Make sure there is no one else nearby the sling.</p> <p>- “<i>Jigiri Yoshi</i>”, to lift off the ground temporarily within 30 centimetres and check if there is a risk of swinging, tilting, or missing of the load when hanging slinging wires. If there is any abnormality such as the load moving the moment it is lifted, the load floats, stops the hoisting, and unloads, the boom may break, and the suspended load may move, so be careful.</p> <p>Other notes</p> <ol style="list-style-type: none"> 1. Assigning relevant personnel based on the work plan and making their instructions, chain of command, and scope of work known. 2. Designate a person in charge of slinging operations, and confirm the route, weight, type, shape, quantity, etc. of the suspended load. 3. Follow safe working procedures, such as using a “brace” when hanging an angular load. 4. When mixed loading and unloading is unavoidable, it shall be limited to two types, each of which shall be bundled, and then the entire load shall be bundled into a single load. 5. Perform a preliminary inspection of the slings. Check and replace the inspected tape on the specified date. (Avoid compression joints in the area to be checked). 6. Consider the landing of a load as the reverse of a ground cut, move away from the load and check the balance when removed. <p>Ten lessons for Safety, Health and Environment respectively</p> <p>-Lessons learned from past serious occupational accidents and environmental accidents.</p> <p>-The foreman learned the basic matters to be observed at workplaces.</p> <p>-Make it easy to understand among the workers.</p> <p>-Put up posters at key points on site and hold safety conventions or morning assembly, etc. to remind all the staff and workers about the ten lessons.</p> <p><u>Ten lessons about Safety (S1)</u></p> <p>S1. (Tidy Up, Organise, Clean Up). Tidy up, Organise, Clean Up before and after work; one work, one tidying up.</p> <p>S2. (Dressing Up and Protective Equipment). Dressing up and protective equipment that fits your work type to protect your body.</p> <p>S3. (Openings) Ensure that the openings are restored, closes and off-limits.</p> <p>S4. (Heavy Machinery) Do not go around the heavy machinery.</p> <p>S5. (Calling, Pointing Out) Pointing and calling clearly.</p> <p>S6. (Inspection before bringing in or using the tools) Inspection and check before using or bringing tools and machines.</p> <p>S7. (Up and down work is strictly prohibited) Up and down work is strictly prohibited.</p> <p>S8. (Work procedure and on-site KY)</p>
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	<p>On-site KY before working. If the procedure manual is unavailable, stop working.</p> <p>S9. (Slinging, 3.3.3. Movement) Do not neglect 3.3.3. movement. Slinging is the work of a qualified person.</p> <p>S10. (Compromise, Acquiescence, Neglect, Overlook) Dangers should be watched out on the spot.</p> <p><u>Ten lessons about Health (H1)</u></p> <p>H1. (Complexion, Physical Condition) Complexion check, talk and check the physical condition of each other.</p> <p>H2. (Preparatory Exercise) Prepare for work, relax your body and work safely.</p> <p>H3. (Work Environment) Check the situation before work, make sure to wear protective equipment.</p> <p>H4. (Report) “Hiding work accidents is a crime”. Prompt report whatever accidents, minor injuries, and poor physical condition.</p> <p>H5. (Heat Stroke) Replenish water and salt in advance. Prevent heatstroke with frequent breaks.</p> <p>H6. (Break time) Take a good break without overdoing it. Have a good work.</p> <p>H7. (Rest Day) Get a proper vacation and refresh your mind and body.</p> <p>H8. (Dormitory) Be sure to follow all the precautions and rules of the dormitory.</p> <p>H9. (Fire Prevention) Once again, check out for the fire before going home.</p> <p>H10. (Health Check) Be sure to take a health check once a year.</p> <p><u>Ten lessons about Environment (E1)</u></p> <p>E1. (Zero Emission) Separation is linked to resources according to on-site rules.</p> <p>E2. (Waste Products) Waste on-site storage is everyone’s responsibility.</p> <p>E3. (Waste Products) Do not bury, do not leave, and ensure proper disposal of wastes.</p> <p>E4. (Sediment and Sludge) The only way to judge whether it is sediment or sludge is if it is in the form of mud when it is generated. If it is muddy, it’s construction sludge.</p> <p>E5. (Water Quality) Be sure to check the drainage area and water quality before flushing.</p> <p>E6. (Noise, Vibration, Dust) Careful work and use a device. Prevent noise, vibration and dust when working with a device.</p> <p>E7. (Fuel-efficient Operation) Reduce Carbon Dioxide (CO²) emissions in the field. Use fuel-efficient machinery.</p> <p>E8. (Hazardous Materials) Look for hazardous material, notify and make sure that none of this gets done.</p> <p>E9. (Asbestos) If new asbestos appears everywhere, stop working.</p> <p>E10. (General) Do not cause an environmental accident, do not hide and do not overlook it.</p> <p>Dissemination and development of <i>Kensetsu Trunk Exercises</i></p>
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	<p>-The launch of this exercise is a collaboration between the Ministry of Health, Labour and Welfare. “Stop! Fall Accident Project” by a disaster prevention organisation. In response, the construction industry promotion fund took the initiative neighbour, Japan Federation of Construction Contractors and other organisations to develop and reinforce promoting these exercises.</p> <p>- At Corp. A, female employee athletes participate in the “<i>Kensetsu Trunk Gymnasium DVD</i>” and send out the female employee athletes to the sites of the country and develop demonstration guidance.</p> <p>-In addition, supplement with the radio exercise at the morning meeting on site and at the afternoon meeting.</p>
	<p>Sending out education development</p> <p>-Send out education is a necessary work before entering a new site. Each cooperating company will provide employees with a “construction overview of the site”, “education on basic rules and safe work methods, etc., corresponding to Article 9 “education when changing work content” under the Industrial Safety and Health Act.</p> <p>- Specific implementation of this training, which left to each partner company matters were created as a standard text. To this, each training institutes’ unique rules are taken into account to provide more effective education.</p>
	<p>Safety environment distribution</p> <p>-In addition to the annual plans and policies at Corp A, the contents that should be addressed to prevent recurrence of disasters and accidents in addition to information such as introduces examples of originality and ingenuity in Japan through photographs and diagrams.</p> <p>-Print 30,000 copies each year of Corp A’s safety bible along with the safety digest, disaster prevention cooperatives on site and etc. to Corp A employees, business owners and foreman of subcontractors.</p>
Guidance to the construction office	<p>Disciplined workplace, Visible safety guide</p> <p>- Disciplined workplaces: for the realisation of place management, temporary fences, morning assembly signboards, basic matters in the field as internal standards, etc. Efforts are being made to standardise this at construction sites nationwide.</p> <p>- Visible Safety Guide: the lowest level at Corp. A’s site using illustration for matters to be observed, easy to understand summary, further safety management level</p>
	<p>Safety dialogue, disaster and accident calendar</p> <p>-Safety dialogue: conduct safety dialogue every once a month with the employees at all worksites, foreman and etc. participate and exchange opinions focused on workplace safety, causes and background of the past occupational accidents. Based on the information, questions such as “what would you do on your own site?” will be asked and discussed during the dialogue. By engaging in the safety dialogue from different perspectives able to prevent and improve the risk sensitivity of all participants.</p> <p>-Disaster and Accident calendar is a calendar created by the site office to show the date of the accident with photos, details and precautions. By posting the calendar in a place where to raise the safety awareness among all workers.</p>
	<p>PC pop-up, learning from past disaster cases studies</p> <p>-PC pop-up for serious disasters and accidents: to ensure all the employees are aware of company-wide important matters such as serious disasters and accidents. The company PC starts up a mechanism to display the screen automatically, in order to deliver such events to all employees effectively.</p> <p>-Learning from past disaster case studies: as a result, the degree of seriousness of disasters and accidents (depending on the conditions, deaths or injuries) that occurred on site will be recorded. Corp A will extract the accident cases that</p>

	could have become more serious and points to note in the site and find out the similar cases in the past, in order to generate and distribute the materials that describe the similar disasters and raise awareness among all workers on a monthly basis.
	<p>Issuance of safety digest</p> <p>Corp. A's "Safety Digest" is related to all the work contributing to the safe construction. The formulation of the "safety digest" is based on the Occupational Safety and Health Act and other related laws and regulations as well as the company standards. The "safety digest" acts as a safety bible to explain in detail with illustrations, diagrams and figures. Peer review at the time of formulating the construction plan at sites or questions arising during on-site patrols. The safety digest is published in A4 and pocket editions, so that the workers can refer to it at any time.</p> <p>-The first edition was published in April 1979, in order to respond to the revisions of laws and regulations and the changes in internal standards etc. Therefore, the "safety digest" was revised every two years, the current latest version is Safety Digest 2022 Edition.</p>
	<p>Implementation of danger simulation training (on the job training) inexperienced</p> <p>-Hands-on safety education was conducted among the young and inexperienced employees to recognize the danger sensitivity of to enhance site safety.</p>
Safety Management using IT	<p><i>Karisma-net</i> information (internal usage only)</p> <p>- "<i>Karisma-net</i>" is related to safety and environment, for the company's internal use which summarises the information to the portal site. Various forms and internal notices or manuals etc. can be viewed and used via this portal site. Various systems and convenient off-site homes can be accessed via specific page links.</p>
	<p>Disaster and accident (case studies) information system, disaster navigation system</p> <p>- Create a database, review case sheets for the occurrence status and an overview of countermeasures for the occupational accidents and disasters that occur at Corp. A site. In addition, in the "Disaster Case review" via various perspectives such as ages, experiences, occupational, unused protective equipment etc. can be analysed.</p> <p>-In addition, examples of occupational accidents other than Corp. A (welfare data from the Ministry of Labour and Japan Federation of Construction Industries). Using AI from a database of 72,000 "Kashima Safe" to develop a navigation system (K-Safe). The work content input into the system and the examples of work accidents are displayed. The data can be used for KY, work procedure manuals, preliminary review meetings etc.</p>
	<p>Computer Generated (CG) Animation</p> <p>-Create CG animation aiming for zero serious disasters and accidents. It is difficult to express in photographs or drawings to make people feel the fear of disasters, therefore, creating videos to show the situation from various angles is able to enhance the sense of danger and help to prevent recurrence of similar accidents in order to promote the safety education among workers.</p>
	<p>Operation of patrol relay system</p> <p>- The patrol system will be carried out by branches, branch offices, and headquarter offices, to simulate matters that are noticed during patrols, raise up the questions and measures to improve the safety issues.</p>
	<p>Cooperating company information system (Subcontractor) database in the system</p> <p>-Based on the on-site evaluation, disaster history information, and external information, transactions with business partners (cooperating companies)</p>

	performance, foreman's work performance, construction results will be included in the database system for sub-contractors as a guidance.
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Information above provided by Corporation A on 13th Oct 2022.

Corporation C is one of the big five general contractors in Japan, and maintains a similar safety schedule and program. In the early morning, the job site gathered with the workers at the registration point to proceed with the attendance scan system with their body temperature measurement to ensure the workers' body condition is fit for work. The workers start off with the necessary personal protective equipment check and walk along the corridor to their workers' restroom for morning assembly meetings and the warm-up exercises. The worker restroom consists of fire extinguishers, fire sprinklers system, ventilation system, refrigerators, individual desks and chairs for each worker, and personal baskets and standing panels are provided for each desk for safety and hygiene purposes. In terms of worker welfare, the general contractor set up a small scale of convenient stores for the workers to mitigate the commuting time and optimise the working production as the job site is far away from the town area.

At the Corp. C's job site morning safety meeting, each worker will check on their safety belt securely fastened around his waist and the safety helmet placed on his head firmly with the chin strap fits snugly. Each person automatically and spontaneously helps the other companions to check for their safety belt and safety helmet to make sure everything is in order. The morning safety meeting is displayed as live broadcasting through the monitors with audio provided, each of the workers able to receive the briefing via the video-audio system at the workers' restroom. The briefing session included the overview of the site conditions and progress, the cleaning groups handled by which company, the locations and schedules of the heavy machines and equipment, the safety concerns such as flammable and poisoning gas location, and any updates of the day. The safety briefing presentations use different colours and shapes to highlight all the key points for better understanding and provide effective communication among the workers on sites. In addition, the Corp. C has customised their own safety and health drama style videos according to trades, some with and some without language, which are demonstrated daily on the monitor screens to constantly remind workers to work safely on site. Some videos

will be repeated 5 minutes daily.

Due to the multilayer sub-contractor system, some sub-contractors own many workers while others have only one worker for certain trade work. Therefore, the daily KY meeting was conducted according to the trades, led by the foreman or the sub-contractors' representatives to their workers to achieve better communication for safety concerns to equal sharing of risk during the operation.

The newcomer education is one of the basic activities in-charge by the sub-contractors and general contractors. In general, it is the responsibility of sub-contractors to provide safety education to the newcomers and new entrants before sending them to the construction site or before the commencement of work. In order to improve and strengthen the safety knowledge among the newcomers, the general contractors will provide newcomer education to all new members whether they have site experience or no experience at all. In Corp. C's job site, the newcomer education materials were designed multilingual with photographs and icons, printed out in A4 size, covered with plastic laminated and provided to all newcomers in the morning assembly. There are four languages used for the explanation on the education materials namely Japanese, English, Chinese, and Vietnamese languages to eliminate misunderstanding and standardise the safety concept among the local and foreign workers. In order to remind the newcomers, the rules and regulations are well-explained in a simple way to provide a better understanding among the workers to maintain a pleasant and comfortable workplace. To be specific, the newcomer education content consists of rules and guidelines as follows:

1) Rest area

- a. Please take your garbage home and keep the area clean and tidy.
- b. Please put your personal belongings on the desk compactly in the basket.
- c. Please push the chairs back into the table before cleaning every Friday at 1 P.M.
- d. Use outlets with a timer to charge the battery.
- e. Check if there are people in the room or not when leaving the room (by calling out "Anyone there? I will turn off the lights!") If there is no one, turn off all the lights.

2) Facilities such as washing machine

- a. Wash the clothes that stick with concrete or paint by hand before putting them into the washing machine.
- b. After washing is completed, do not leave the clothes unattended, collect them quickly.
- c. Please hang the washed clothes on the raincoat to dry.
- d. The route to the drying area is indicated on the handout.

3) Smoking area

- a. When the ashtrays are piles, collect the cigarette butts into the red pail. Any carelessness can lead to a fire, so extreme care is required.
- b. Please throw the ashtray butts and fire extinguishing water into the red pail every day for cleaning duty.
- c. Please collect cigarette butt pail in the designated plastic bag every day. When the plastic bags are piled, put them in the burnable garbage in the sorting yard.
- d. Please sweep and pick up garbage daily to keep the floor clean.
- e. Please take the cigarette butts home individually.

All the electric equipment and tools that require charging are stored centrally in the same steel cabinets with sub-contractors' labelled. In Corp. C's job site, the general contractor is paying full attention to fire prevention matters. Therefore, the site work is laid out in such a way that anything and everyone must focus on preventing any possibility of fire.

Besides, the materials storing and working areas by each trade will be decided and re-arranged a day before, or after the inspection and updated in the drawing. Brightly coloured warning signs and warning lines will be put up at the re-planned areas according to the task progress by trades. The re-planned working areas will be updated and announced during the daily safety briefing meeting to provide comprehensive information for all workers. All updated site information will be clearly described on the drawings shared among the foreman or subcontractors' representatives, and no ambiguous information will be created. On the storage and safekeeping matters, the flammable and

non-flammable items, conductive and non-conductive materials, and electrical equipment are well-organised and store in specific cabinet labelled with the sub-contractors' company, daily and weekly inspection will be carried out for these materials and equipment for safety purpose. The details, conditions and usage of these items will be recorded and updated in the safety logbook or form for monitoring purposes.

Although the safety training and skill training are given to the workers, yet, there is no test or assessment after the training or education session, which is a challenge to know whether the workers, especially the newcomers understand the safety knowledge and are able to retain the related knowledge after the training. Therefore, supervision and monitoring are important to be carried out regularly by the sub-contractors and general contractors on site.

Neatness and orderliness were found in Japanese construction sites. On Japanese construction sites, doing work safely is the most important and biggest issue, the most important thing to be taken care of every day and every second, it is the priority for everyone on sites. From the above, there is a strong focus on the construction safety culture. Some of the safety practices and activities are based on a voluntary basis. It can be claimed that the Japanese builders provide very comprehensive safety measures on construction sites to all the workers. Japanese contractors are stricter and more self-disciplined to implement safety measures on construction sites to ensure all workers' safety and health during the working period. The success of some safety programs is directly proportional to the redundancy of their warnings and continuously reminding the workers (Levy, 1990). Life has no-do-overs, same goes to on-site operation. Since there is no assessment or examination during each operation among the workers, therefore, the constant reminder and periodic inspection forms the core of the safety program.

How can foreign workers be integrated into the local culture on site?

A shortage of construction related workers is always a chronic issue both in developed and developing countries. In Malaysia, there is always evidence on the challenges such as communication barriers and culture differences induced by foreign workers in the

construction industry (Abdul-Rahman et al., 2012; Ismail et.al., 2018). In Japan as well, to address the manpower shortage as well as to reduce the number of construction site accidents caused by the increasing number of foreign workers involved in the construction industry, the Japanese government has mandated all foreign workers are compulsory to undergo the skill training system stipulated by the act to conduct appropriate training to acquire skills to strengthen and protect the foreign workers. Japanese construction companies consider that foreign employees may not be as aware of safety as local employees from a young age, so they have safety warning signs, safety signs and safety instructions in multiple languages on site to ensure that all site employees receive agreed safety messages. In the B Corp. site, a pairing system is implemented with the ratio of one local worker to two foreign workers as a pair on site. As a result, foreign workers can adapt easily and quickly to the local site culture through this system, as local workers are able to help them identify problems and give explanations during daily operations to enhance the foreign workers' understanding of work safety on site. Besides, B Corp. initiated a Japanese languages competition with prizes to promote the Japanese language capability among the foreign workers. This is an unwritten rule, but it is a good approach.

In addition, the warmup exercises are implemented in most of the Japanese construction sites every morning before starting their work on sites. It is very much worth emphasising that there are warm-up exercises at the beginning of the morning assembly meeting; at the end of each meeting, there is a spiritual shout out to close the meeting to show their support and the idea of togetherness among all. All these activities can reflect a spiritual bonding among all the workers from different companies and backgrounds. Constantly reminding workers and employees to take note of the safety concerns, related safety precautions, wear PPE and work safely leads to a safety culture that is directly proportional to the success of the safety program on site. Rituals should not be overlooked; it is the key to creating the safety culture on site.

Conclusion

The author was giving a visitor's perspective on safe working practices on Japanese construction sites, which completely opened the author's eyes to safe work practices on construction sites. Safe working in Japanese construction sites is an example of how prevention is better than cure. The Japanese construction companies show a strong focus on safe work on site and always foreseen the safety issues; give clear instructions on safe working practices for all trades operation on-sites. The establishment of a site safety committee from subcontractors' representatives is not mandatory in the Act, but this is to take initiative to nurture a good safety practice on-site, to spread the responsibility while reinforcing the idea that maintaining construction safety on site is everyone's responsibility. Although the Japanese construction companies require the involvement of foreign workers, the companies do not neglect their safety and welfare; Japanese construction companies shows their commitment to their workers by sending them to receive proper safety education, understanding safe work practices, constantly reminding them of their daily work, implementing a pairing system on site and showing compassion and understanding for their hard work on site. This has led to the continuation of a culture of safety creation and maintaining the concept of togetherness among the company and the workers from different trades and companies on sites. All the above are suitable for use in the construction industry in Malaysia as well as in other developing countries, especially in view of the safety hazards associated with the large number of unskilled foreign workers coming into the Malaysian construction industry.

4.5.2 Accident Prevention Methods Suitable to be Implemented in Malaysian Scenarios

To identify the accident prevention methods that might be suitable to be implemented in Malaysian context, the following table showed the on-site safety practices implemented in the three Japanese construction sites. Several common practices that are implemented in the Japanese construction sites can be used in Malaysian context (Table 4.4).

Table 4.4: Common practices implemented in Japanese construction sites

Construction site accident prevention methods that can be implemented in Malaysian context
Morning ritual with the following activities for every worker on site
Warm-up exercises before commencement of work
Toolbox meeting & KY meeting
KY safety manual (form to be filled by subcontractors or representative)
Risk prediction activity by trades, recorded in hardcopy
Call out slogans “spiritual shouting” at the end of each meeting to build a sense of solidarity and remind each other that work operations must be safe
Newcomer safety education for workers reporting himself first day on site
Body health checking for newcomers including blood pressure on sites. Body condition will be recorded and kept on site at the office.
Verbally explanation safety rules, project information and provide power-point, videos, pictures, texts and hand-out materials
Daily, weekly and monthly meeting schedule on safety according to safe work cycle
Operation of patrol system
Provide hand-out materials of safety education with multi-languages to suit the new foreign workers who come from different countries
Verbally explain safety rules and regulations, project information and provide power-point, videos, pictures and texts in multi languages.
Create dramatic style videos (non-verbal), contents of the safety precautions change with the seasons. The videos repeated daily without interruption in the workers' restroom.
Safety management using Information Technology
Disaster and accident (case studies) information and navigation system, Computer Generated (CG) Animation is created for zero serious disasters and accidents, and cooperating company information system that based on the on-site evaluation, disaster history information, and external information, transactions with business partners (cooperating companies) performance, foreman's work performance, construction results will be included in the database system for sub-contractors as a guidance.
Guidelines to construction office
Discipline workplaces, visible safety guide, safety dialogue, Personal Computer (PC) pop-up for serious disasters and accidents, learning from the past disaster case studies, implementation of danger simulation training. Efforts are being made to standardise this at construction sites nationwide.
Approaches to Subcontractors
Suspension or stop work during irregular works or tasks. The basics of sling work of <i>Gu-Pa</i> Campaign to approach the heavy-vehicle types construction machinery and vehicle type cargo handling equipment as part of the communication; while the 3.3.3. Campaign carried out to prevent accidents during slinging work.

4.5.3 Malaysian Construction Site Safety Management System

The sub-chapter aims to uncover the current safety management system in Malaysian construction sites. The visited construction sites and companies will be kept private and confidential. In order to protect these companies, no construction site or corporation is intentionally targeted in this chapter, and these construction companies or sites will be referred to by alternative names such as Corp. G, Corp. H, Corp. J. Some of the common safety features implemented on construction sites were explained with the aid of on-site

photographs. The safety features include the general safety practices such as site cleanliness, safety netting, use of PPE, scaffolding, waste materials storages and materials storage area (Figure 4.11-4.14).



Figure 4.11: Project site with no safety hoarding or fencing (Corp. J)



Figure 4.12: Project site with no proper materials and waste storing areas (Corp. N and Corp. J)



Figure 4.13: Project site with no safety netting, scaffolding is not proper installed and worker is not wearing PPE (fall prevention) (Corp. H)



Figure 4.14: Project site with no safety label or barrier for the exposure reinforcement bar and poor site cleanliness (Corp. H)

Safety Culture

The researchers claimed that the safety culture is the fundamental pillar to improve the safety performance at construction sites (Fang and Wu, 2013; Ofori et al., 2013). Therefore, the safety culture is the vital element to maintain the safety performance at the construction sites. The results obtained from field observations, interviews, and interpretations with the aid of photographs show that the power of culture is more effective, proactive, and enduring than the power of laws and regulations. Simply put, culture is a form of self-monitoring, whereas laws are monitored through regulations. In other words, while laws and regulations provide the framework for work safety in construction sites, a safety culture is cultivated through daily activities, mutual reminders, self-reminders and repetition. Both are indispensable. There are affirmations in Malaysian regulations, safety and health related policies, and master plan to establish a safety culture, especially the current use of OSHA act was practised to enhance the safety and health culture, however, the level of awareness and practicability of it is still considered as low where in practice, the on-site operations observed on the ground do not reflect a safety culture. Instead, the on-site operations are reversed. Therefore, the lack of safety culture and lack of safety awareness in the construction sites must be implemented and cultivated immediately in the Malaysian construction industry. Safety culture can be cultivated through safety education and repetition in daily activities. Maintaining safety on site is the culture and core that must be maintained by all members. There is a strong focus on the Japanese construction safety culture. Some of the safety practices and activities are based on a voluntary basis. It can be claimed that the Japanese builders provide very comprehensive safety measures on construction sites to all the workers. The self-reminder brought about by safety culture is reflected in Japanese construction sites. In the vast majority of Japanese construction sites, the combination of safety culture and safety laws has resulted in more flexible and efficient on-site safety operations.

Chapter 5 Safety Measures in Construction Sites Implemented in Construction Industry

This chapter aims to explore the site safety measures in construction sites and the perspectives of government agencies and construction site personnel towards the current safety related issues, particularly focusing on the foreign workers in both nations. The outline of this chapter will start with the safety measures in construction sites implemented in the construction industry and the perspectives towards current safety and health related issues in the construction industry. The selection of construction companies and sites for this study was based on the scale of construction companies in Japan and Malaysia. The size of the selected construction companies are large construction companies in Japan and Malaysia such as local Japanese construction companies with a long history and Grade 7 contractor construction companies in Malaysia, which are listed as the top ten (10) construction companies in both nations as per 2022, respectively. These construction companies have more resources to support the company's operations and pay more attention to the safety of construction sites and employees, so that the relevant information can be conducted to obtain detailed observations and interviews. The construction companies in Japan and Malaysia such as Kajima Corporation, TODA Corporation, Takenaka Corporation, Shimizu Corporation, Sunway Construction, SLG Construction, *Seni Bahagia*, YTL, and etc. were selected for the study. A comparison between Japanese construction sites and Japanese construction companies based in Malaysia via observation to obtain the similarities and differences between Japanese and Malaysian styles towards construction site safety in construction sites.

Qualitative approaches namely observation and semi-structured interview were applied to achieve the objective. The construction site observation was conducted among three Japanese construction and Malaysian construction sites respectively; while the semi-structured interview sessions were conducted among the Japanese government agencies namely JNIOASH and JCOSH representatives), construction site personnel (namely Project Managers and Site engineers) in Japanese sites and Malaysian sites. In order to protect these construction companies or corporations and government agencies, no construction companies or corporations and any government agencies is intentionally

targeted in this chapter, and therefore, these interviewees from the construction companies or corporations will be referred to by alternative names such as Interviewee A, Interviewee B, Interviewee C and so on.

5.1 Safety Measures in Construction Sites Implemented in Construction Industry

Safety is one of the criteria for success in ensuring the quality of a construction project (Konno, 2018; Fan et al., 2020). The construction industry is often associated with fatal accidents in line with economic growth. The high construction fatal rate with ineffective measures brings negative effects to the industry such as increasing the direct costs, indirect costs and delaying the construction project completion (Ayob et al., 2018; Buniya et al., 2021). The causes of fatal construction fatal accidents were identified as unsafe work procedures and job site conditions that involve those high-risk activities on construction sites (Hamid et al., 2019). Construction sites are famous for their dangerous nature of work such as a cluttered working environment with surrounding objects and poor working surface conditions (Adnan and Baharum, 2020; Peng and Chan, 2020).

The Japan Construction Occupational Safety and Health Association (JCOSHA) emphasised on the two pillars of safety and health management in the construction industry in Japan. This management consists of the roles of related contractor and principal employer. The employer is responsible to manage safety at site by engaging the safety of the employed workers; while the responsibility of the principal employer shall patrol a project site and give instructions to control each work and prevent a danger in co-exist work on site. In light of this, the safe work cycle is significant in construction sites daily operation. The Ministry of Health, Labour and Welfare (MHLW) issued the Guidelines on Construction Occupational Health and Safety Management System in April 1999 (revised in 2006) to promote a framework for construction companies, including mutual cooperation between employees, general contractors and their subcontractors during the construction process to improve worker health and create comfortable working conditions and enhance the health and safety standards of construction companies. This

system has led to the implementation of the most widely known initiatives which are to operate Plan-Do-Check-Act (PDCA) cycles; and to promote continuous voluntary health and safety activities at construction sites. The PDCA cycle consists of personnel training, innovation, appropriate evaluation and improved efficiency to eliminate the risks and harmful factors concerning industrial accidents on work sites to increase the company's reliability and credibility to enhance the development of the company. The employers in the construction industry should carry out their own initiatives and voluntarily adopt these management systems. The PDCA acts as a strategy tool to provide an effective approach for problem solving and manage changes with the characters of continuous loop of planning, doing, checking and acting. Most Japanese construction sites implement their safe work cycle in-line with the PDCA framework.

In this regard, the Japanese construction industry takes safety very seriously to protect workers from accidents that could result in injury or serious death while working on site. The author was delighted to be invited to participate in a Japanese construction sites visitation to learn how Japanese builders effectively enforce safety practices and how construction workers can effectively work with Japanese builders' countermeasures. The safety measures on construction sites such as general safety measures, personal protective equipment, fall prevention system, fire prevention measures and wasted materials storage areas on construction sites were further discussed in the following subsections.

5.1.1 Method

The qualitative method was used in this chapter. Qualitative method able to explore and understand the meaning of that individuals or groups to social or human problems (Creswell, 2014). The data collection involves observations and semi-interviews. Observation is one of the common data collection approaches (Fellows and Liu, 2008). One of the significant parts of collecting data is the author observing the environment and the workers' behaviour during the visitation on site. Data, evidence, and rational considerations shape knowledge (Creswell, 2014). The first line of observation and information was obtained by collecting evidence, such as photographs and write down

information, at the site and participating as an observer in the activities at the site, interacting and communicating with the staff at the site. In practice, the author records the information based on the safety measures conducted by the workers on sites by observations. The outline of the article begins with the construction site safety measures including the general on-site practices including site entrance on-site temporary facilities, personal protective equipment, fall prevention system, fire prevention measures, wasted materials storage areas, some insights on how construction companies' response to the safety culture of foreign workers. Some of the common safety features implemented on construction sites were explained with the aid of on-site photographs.

5.1.2 Procedures

The construction site to be visited on the first day is located in the heart of Shibuya, Tokyo, a downtown area. The author, led by a colleague, walked a distance from the Shibuya station, through the busy streets, and arrived at the entrance to the construction site. The appearance of the construction site is so neat and clean that it is difficult to notice that it is a construction site. The visits to the three construction sites were conducted separately, with one day allocated to each construction site to allow for better participation in the day-to-day activities on site. The author was led by the site personnel, namely construction project manager and general manager, to participate in the site daily work procedures started with daily morning site assembly including morning warm-up exercises, safety meeting, tool box meeting, and site inspections. The common safety features implemented on construction sites which are explained with the aid of on-site photographs, does not deliberately target any site or any corporation.

5.1.3 Construction Sites in Japan

The author visited three Japanese construction companies located in different areas in Tokyo: new construction of high-rise buildings by KAJIMA Corporation, New TODA Headquarters building by TODA Corporation and NHK Shibuya Broadcasting Centre

reconstruction phase 1, new construction by TAKENAKA Corporation. In order to protect these companies, this study does not intentionally target any construction sites or companies, which will be referred to by alternative names such as A Corporation (A Corp.), B Corporation (B Corp.) and C Corporation (C Corp.) for academic research purposes only.

The author was refreshing and surprised with the daily safe work cycle implemented in construction sites and all the workers can maintain the site operational safety as their priority on a daily basis. It draws on the views of an academic from a developing country - Malaysia, who shares the exposure to the Japanese construction sites after visiting three construction sites. This chapter provides insights as references from the Japanese wisdom in addressing common challenges, particularly in relation to construction safety issues, that may be of some use to the construction industry in other developing countries.

5.1.4 General Safety Measures towards Construction On-site Activities

“Safety First” is always prominent in most of the Japanese construction sites. Many things that strike and draw the attention of a Malaysian by visiting Japanese construction sites. Especially, many safety measures are unseen and new to Malaysians. The characteristics of Japanese construction sites, in this context it means the safety measures and cultures differences, and how Japanese construction companies are able to operate in a safety-focused manner were included. The safety measures on construction sites were categorised into general safety measures, personal protective equipment, fall prevention system, fire prevention measures and wasted materials storage areas on construction sites were further discussed in the following subsections.

In the eyes of Japanese builders, construction safety assumes a very important issue. For instance, the on-site safety measures such as general safety measures, personal protective equipment (PPE), fall prevention system, fire prevention measures, wasted materials storages, safety meetings, etc. are significantly important.

Their concern for safety on construction sites is manifest. The construction buildings

located in the city centre are always completely covered by a layer of plastic netting; or covered by a layer of reinforced plastic sheeting as required. The plastic netting or plastic sheeting covering the building to avoid any debris fallout from the building to protect the public. The plastic netting or plastic sheeting are always a mild or sky-blue like colour, so as not to spoil the appearance of the city.

The safety measures relating to temporary protection can be clearly observed on construction sites. A solid metal hoarding fence at least 3 metres high, completely set up on the border, enclose the site at ground level. In addition, the white-coloured folding entrance gates are designed to facilitate the entry and exit of construction vehicles to the site. Site staff stationed at the site gates to ensure safe vehicle access. The noise level metre is displayed prominently on the hoarding fences before the entrance of the site. Normally, the sound level is remaining between the range of 60-65 decibel (dB), and the vibration range between 25-30 dB of the construction sites. The noise and vibration generated from the construction sites could pollute the urban areas easily. According to the Guidelines for the Prevention of Noise-Induced Impairments (1992), the employer shall conduct the measurement results in case the noise level in 85 – 90 dB requires the workers in noisy work wear ear protection as necessary (clause 5(2)) (Figure 5.1).

The outer surface of the hoarding is decorated prominently with different shapes and colours of permission, approval certificates, sustainable development goals logo, and safety posters as a good-natured warning to people who enter the construction site. These decorations display the construction site safety rules such as wearing a safety helmet before entering the site and abide by safety rules and regulations.



Figure 5.1: Construction site entrances

Site Entrance – Site Cleanliness

The Japanese construction site entrance includes a series of safety measures starting from the registration station. The registration station is the first stop after entering the site. The registration proposes to take workers' attendance on a daily basis before commencement of work. The registration process is no longer a traditional way such as writing name and signature on attendance slip or form. At the registration point including standing point, body temperature monitoring system, face attendance scanning system to check in and check out, disinfectant hands station, colourful safety posters with strict rules and regulations posted on the walls as a good-natured warning to remind anyone who entered the construction sites for mental preparation (Figure 5.2 and Figure 5.3).



Figure 5.2: C Corp. Site Entrance



Figure 5.3: B Corp. Site Office

On-site Temporary Facilities

The employer shall not only comply with the minimum standards for preventing industrial accidents provided for in this Act, but also endeavour to ensure the safety and health of workers in workplaces through creating a comfortable working environment and improving working conditions, stated in the Article 3 (responsibilities of employer, etc.), JISHA 1972. The size of the typical Japanese site office is a good indicator on how the general contractors organise the materials, machinery, workforces of a project in the site. The site offices are generous, well-equipped and comprehensive in the eye of the world. The layout plan of the workers' rest rooms is indicated on the wall panel inside the site office (Figure 5.4). The rest rooms are separated males and females to have better privacy and respect. Workers' rest rooms are accommodated with individual desks, chairs, temporary utilities and facilities such as microwaves, refrigerators, ventilation system, fire prevention system, monitors, separated male and female wash rooms, etc. (Figure 5.5).



Figure 5.4: Workers' restroom at Corp. C's site (Photos taken on 17th Oct 2022)

It is worth mentioning that the monitors provide live broadcasting of safety briefing, highlighted with different colours and shapes, photos and videos to indicate safety related information, therefore, all the workers are able to access the latest site safety information even at the workers' rest room.

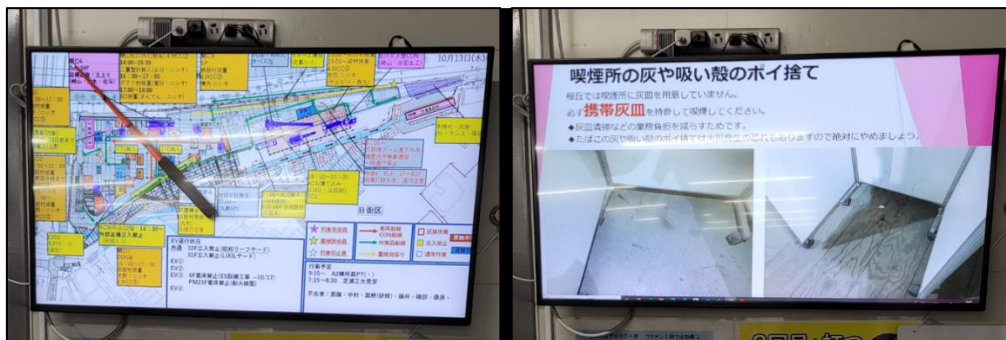


Figure 5.5: Monitors at Corp. C's site workers' restroom

5.1.5 Personal Protective Equipment (PPE)

Walking through the entrance, workers head to the Personal Protective Equipment (PPE) storage rack to put on individual safety equipment and change clothes to suit their work

trades activities on a daily basis (Figure 5.6). Workers were encouraged to check the installation and function of respective PPE before use is a necessary part to ensure their own safety, and it is a culture that is passed on to every employee (Figure 5.7).



Figure 5.6: PPE storage area at A Corp. site (left)

Figure 5.7: Safety belt hook checking station at C Corp. site (right)

The site staff and workers’ safety helmet are indicated with their affiliated companies, the wearers’ identity such as blood type, body conditions, trade, company, and level of experiences to make it easier for site personnel to notice and recognize these workers during operations in construction sites for better supervision and guidance (Figure 5.8). In B Corp. site, the stickers will last for 7 days on site for newcomers and the function of the stickers is to indicate the health condition of the workers, to assign tasks according to the workers’ conditions (Figure 5.9). For instance, assign simple job to high-risk workers; to pay attention to the new workers on sites. Individual stickers will be removed after 7 days.



Figure 5.8: B Corp. site staff safety helmets and sticker for name and blood type

Figure 5.9: 7-days stickers for newcomers in B Corp. sites

5.1.6 Work at Height (Fall Prevention)

Falls from heights account for most of the construction fatal accidents. Fall hazard incidents are injuries produced by impact between the injured person and the source of injury when the motion producing contact was generated by gravity (Hamid, et al., 2018). According to the official statistics, many countries recorded a high percentage of accidents for fall from height, for instance, 43% in Malaysia, 44% in Japan (DOSH, 2020; JISHA 2020) among all other construction accident types. The fall protection is used inconsistently in construction sites (Kaskutas et al., 2013). Various measures have been taken to improve safety in construction sites including the establishment of comprehensive safety management systems in construction sites (Jin et al., 2019). To minimise the causes of accidents and injuries, the safety measures must be applied effectively (Abukhashabah et al., 2020). The major causes involved in falling such as unstable working surfaces, failure to use fall protection equipment and accessories, human errors (unsafe behaviours), improper scaffolding works on construction sites. Several causes were identified by DOSH after formal investigation to each fatal fall from height accident cases, for instance, the body lifeline was attached unsafe not qualified person; the victim was not using any body hardness during the incident; the working platform was not suitable to be used or damaged and rotted; the employer failed to provide a safe work procedures (SOP) and risk assessment (Hazard Identification, Risk Assessment and Risk Control, HIRARC) for working at high and work without supervision.

The body harness is one of the key safety prevention methods during work at height on site. However, negligence is one of the causes of accidents. How to make sure all the workers are obeying the rules of wearing a body hardness on site is another challenge. In Corp. C, there was a fall from height injury case, whereby the worker not using the safety hook belt to climb up and down the stairs to perform work at height, approximately 5 metres in height. The Japanese builders tend to strengthen the implementation of safety body harness by manipulating the colour stickers/tapes on the body hardness (on the safety hook or wires, Figure 5.10) on a weekly or monthly basis, an interesting and brilliant idea. The colour changes on the body hardness for the following week or month

are explained through weekly safety meetings to reinforce the attention of all workers and staff. Workers must get permission and supervision while working at height or high-risk operation (1.8 metres and above) including using the scaffolding.

It is not difficult to find some of the necessary engineering safety controls on site, such as reinforced guardrails with netting surrounding all openings and all the underground access points (the size allow a person to enter) will be covered with heavy metal panels to avoid tripping / falling into the point.

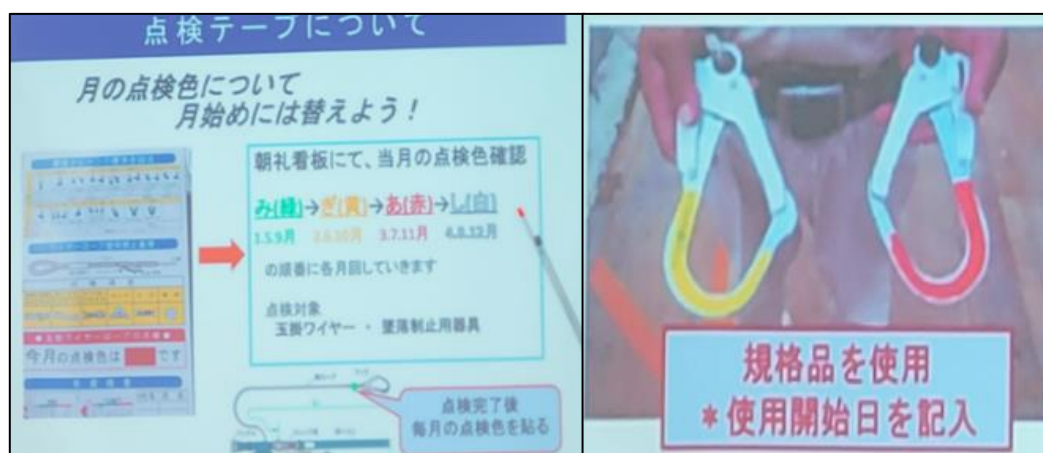


Figure 5.10: B Corp. site fall prevention system (colour code of the month)

5.1.7 Fire Prevention Measures

The Japan Industrial Safety and Health Law 1972 stated clearly that the employer must take measures relating to the relief and protection of workers against the occurrence of fire at the workplace (article 25). In the C Corp. job site, the general contractor is paying full attention to fire prevention matters. Therefore, the site work is laid out in such a way that anything and everyone must focus on preventing any possibility of fire. By observing the construction of underground structures at the job site by C Corporation, the materials storing and working areas by each trade will be decided and re-arranged a day before, or after the inspection and updated in the construction drawings. Brightly coloured warning signs and warning lines will be put up at the re-planned areas according to the task progress by trades. The re-planned working areas will be updated and announced during the daily safety briefing meeting to provide comprehensive information for all workers.

All updated site information will be clearly described on the drawings shared among the foreman or subcontractors' representatives, and no ambiguous information will be created. The steel columns were covered with a layer of plastic sheet at the bottom parts on the working point where the welding work is ongoing above the steel beams. This is to prevent the flames generated from the welding work float down to the underground construction which would lead to fire or explosion (Figure 5.11).



Figure 5.11: Plastic sheet to prevent fire



Figure 5.12: Equipment storage cabinets

On the storage and safekeeping matters, the flammable and non-flammable items, conductive and non-conductive materials, and electrical equipment are well-organised and stored in specific cabinets labelled with respective sub-contractors' companies. The materials and equipment storage will be inspected on daily, weekly and monthly basis, the inspection result will be updated on the safety manual or form attached at the outside of these materials and equipment, attached on the storage cabinets for safe monitoring purpose. All the electric equipment and tools that require charging are stored centrally in the same steel cabinets labelled with subcontractors' information (Figure 5.12). The details, conditions and usage of electric equipment and electrical boxes will be recorded and updated in the safety logbook or form for monitoring purposes.

5.1.8 Wasted Materials Storage Areas

Besides, the employer must take necessary measures for preventing health impairment at the workplace (article 22 in JISHA 1972). All the construction wasted materials sorted and organised in a systematic way in different containers, trolleys and baskets covered with a layer of netting, well labelled, and stored according to the types located at the corner of the site (so called “storage place”) to avoid accidents such as trip-off and machine failure caused by debris. All the wasted materials to be collected according to the types, to be removed and handled by specific sub-contractors properly (Figure 5.13). The entire construction sites are well maintained in a clean and tidy manner to avoid any incidents such as trips off which might lead to accidents among the workers.



Figure 5.13: Wasted materials storage areas at A Corp. site

5.1.9 Summary of On-site Practices Implemented in Japanese Construction Sites

To identify the accident prevention methods that might be suitable to be implemented in Malaysian context, the following table showed the on-site safety practices implemented in the three Japanese construction sites (Table 5.1). Several common practices that are implemented in Japanese construction sites can be used in Malaysian context.

Table 5.1: Summary on-site practices implemented in Japanese construction sites

On-site safety practices	Corporations		
	A	B	C
Individual			
Personal Protective Equipment (PPE) provided to individual	/	/	/
PPE checking station	N/A	N/A	/
Facial recognition system for body temperature checking at registration station	/	/	/
Safety colour (changed every week, subject to the contractor site teams' decision) for body life-lines and hooks	/	/	/
Groups			
Morning ritual with the following activities for every worker on site	/	/	/
Warm-up exercises before commencement of work	/	/	/
Toolbox meeting & KY meeting	/	/	/
KY safety manual (form to be filled by subcontractors or representative)	/	/	/
Risk prediction activity by trades, recorded in hardcopy	/	/	/
Call out slogans "spiritual shouting" at the end of each meeting to build a sense of solidarity and remind each other that work operations must be safe	/	/	/
Newcomer safety education /safety briefing			
Newcomer safety education for workers reporting himself first day on site	/	/	/
Body health checking for newcomers including blood pressure on sites. Body condition will be recorded and kept on site at the office.	/	/	/
Verbally explanation safety rules, project information and provide power-point, videos, pictures, texts and hand-out materials	/	/	/
Provide stickers to indicate new workers with varies health condition and age for seven days	N/A	/	N/A
Facilities on sites			
Worker restroom with digital monitors to display safety information with easy understanding contents	/	/	/
Smoking area with safety notices	/	/	/
Safety sign boards, information notices with multi-language and icons and symbols	/	/	/
Safety information (i.e., posters) with easy understanding contents displayed in a prominent position	/	/	/
Special cabinets to store machinery and tools to prevent fire event	/	/	/
Wasted materials storage area with labelled	/	/	/
Centralised charging and supervision on tools and battery	N/A	N/A	/
Disaster and accident calendar / notices boards (renewal period might be varied)	/	/	/
Live closed-circuit television (CCTV) on sites to monitor site condition	N/A	N/A	/
On-site communication tools /devices and platforms for safety concerns (internal usage only)	/	/	/
Establish site safety committee among subcontractors with all trades	/	/	/
Reporting safety issues with photos and comments immediately via platforms that everyone can access	/	/	/
Obtain permission to work at high-risk platforms with supervision	/	/	/
Provide safe use manual of dangerous materials (flammable) to workers	/	/	/
Internal system for all subcontractors to request access to plant and	/	/	/

machinery as well as access routes and entrances			
Safety evacuation drilling exercises (internal period can be varied)	/	/	/
Safe Work Cycle			
Daily, weekly and monthly meeting schedule on safety according to safe work cycle	/	/	/
Operation of patrol system	/	/	/
Uniqueness of safety measures for foreign workers on sites (by voluntarily)			
Pairing system with foreign workers (local worker pair with one to two foreign workers)	N/A	/	N/A
Provide hand-out materials of safety education with multi-languages to suit the new foreign workers who come from different countries	Japanese language only	N/A	/
Verbally explain safety rules and regulations, project information and provide power-point, videos, pictures and texts in multi languages.	Japanese language only	Japanese language only	/
Rewarding Japanese language competitions to promote the Japanese language skills of foreign workers	N/A	/	N/A
Create dramatic style videos (non-verbal), contents of the safety precautions change with the seasons. The videos repeated daily without interruption in the workers' restroom.	/	/	/
Provide safety guidelines (safety digest) booklet in line with the law and regulations (update every 2 years) to workers (with illustration and texts)	/	N/A	N/A

From the above summary, several practices can be considered in the Malaysian context, especially the uniqueness towards foreign workforce. Firstly, the safety colour is very useful in the eyes of Japanese construction personnel to strengthen the safety awareness among the workers to pay attention to checking their PPE tools carefully. Morning rituals with warm-up exercises and spiritual shouting are part of the culture in Japanese construction sites to “unite” all workers in their daily work, to check their body condition whether it is fits for work and to build a feeling of “togetherness” among all workers to remind each other mutually to be careful while doing any tasks. This is a good practice as no one can work alone, especially construction processes that require different manpower from different trades and backgrounds to complete the project. However, this is challenging to realise in Malaysian construction sites as this culture does not exist in the Malaysian environment. Besides, regular safety meetings are also practised in Malaysian construction sites, but not as frequently as in Japanese construction sites. Perhaps, Malaysian construction sites could consider increasing the frequency of safety meetings to enhance the efficiency of safety work on sites. The safe work cycle is one of the vital elements to build a safe work culture on site since it can be applied to all workers on site. The safe work cycle acts as an effective “working-rest-reminder” timetable to

provide a “timetable” to all workers on site. This is a good practice that can be considered to be implemented in Malaysian construction sites.

The safety manual is necessary to be implemented in Malaysian context to further enhance the safety awareness among the sub-contractors and their workers. In addition, the safety education to newcomers is necessary to be implemented into Malaysian context as to educate the newcomers whether with or without any field experience with the construction project information and other necessary information to deepen the safety awareness and safety information while working on site, to reduce any inappropriate or unadaptable among the newcomers. With the use of verbal explanation with the aid of videos, pictures (with multilanguage) to elaborate the safety rules, project information is very useful among the construction workers especially the foreign workers who might have language barriers and culture differences and low level of literacy. The body health checking for newcomers is not applicable in Malaysian context as most of the new comers regardless their nationalities or local workers will be conducted their body health medical checking before joining the construction site for administration process. The pairing system with foreign workers (local workers pair with one to two foreign workers (so called “buddy system”) is not applicable in Malaysian context where almost 90%-100% of the construction workforce is constituted by foreign workers. However, the pairing system can be alternately changed to safety training, education and continuous reminder among foreign workers.

In Japan, the establishment of Japan Industrial Safety and Health Act (1972) aims to secure the workers’ safety and health in the workplace to create a comfortable work environment. The Ministry of Health, Labour and Welfare (MHLW) Japan established, implemented and revised the Occupational Accident Prevention Plan positively to tackle the issues related to safety. Particularly, the 13th prevention plan includes the prevention of occupational accidents involving of foreign workers and technical intern trainees by promoting the same safety measures such as installing warning signs and safety notices, and education such as Japanese lessons for construction foreign workers who do not understand Japanese to the same context to prevent occupational accidents.

Besides, the “Guidelines for business owners to appropriately deal with improvement in

employment management of foreign workers” stipulated by the Ministry of Health, Labour and Welfare Japan stated several necessary measures to be taken by the employers to strengthen the employment management of foreign workers especially for safe operations (Table 5.2).

Table 5.2: Safety measures to be taken by employer

(Section 3) Ensuring safety and health	Section 3(1) Implementation of safety and health education Section 3(2) Implementation of Japanese language education Section 3(3) Display signs, notices and etc. related to industrial accident prevention Section 3(4) Implementation of health examinations, etc. Section 3(5) Implementation of health guidance and consultation Section 3(6) Dissemination of related laws and regulations such as Industrial Safety and Health Act.
(Section 5) Appropriate personnel management, education and training, welfare programs, etc.	Section 5 (1) Appropriate personnel management Section 5 (2) Life guidance etc. Section 5 (3) Implementation of education and training etc. Section 5 (4) Welfare facilities Section 5 (5) Assistance for returning to Japan and changing status of residence, Section 5 (6) Points to consider for employers who dispatch or contract workers

In addition, the employers provide foreign workers with Japanese language education and training to further enhance their understanding towards Japanese lifestyle, culture, customs and employment practices etc. Employers are encouraged to implement education and training to create a comfortable working environment and to implement introductory training in their native language (under section 5(2) and section 5(3)). The above statements are in-line with the safety and health education (Article 59) Chapter VI measures in placing workers stated in the Industrial Safety and Health Act.

To tackle the foreign workers’ issues, the Foundation for International Transfer of Skills and Knowledge in Construction (FITS) was established in January 2015 as a General Incorporated Foundation aimed to create a comfortable environment to work and live for foreign workers, to give support to the foreign construction workers and accepting companies. It was commissioned by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) to undertake the promotion of Foreign Construction Worker Acceptance Program. To be clear, FITS acts as an appropriate labour environment supervising agency for specified skilled workers and conducts monitoring visits to those accepting companies. FITS set up hotlines in native languages up to five languages for foreign construction

workers to provide consultation. To this end, Japanese governments and the construction companies put efforts to protect and educate the foreign construction workers.

In Japan, foreign workers who are employed in the Japanese construction industry must have passed the Japanese government's technical certification for foreign workers and to undergo the technical trainee program for at least three (3) years in Japan. Based on the above statements "Is it the lack of technical skills of foreign workers or cultural differences that have led to the rise in construction accidents in recent years?".

The existing literature review on construction foreign workers conducted in different countries identified challenges faced by foreign workers. For instance, majority of research focus on foreign construction worker's safety and health has been conducted in Hong Kong and China (Man et al., 2017; Lyu et al., 2018), Korea (Korkmaz and Park, 2018), Malaysia (Ismail et al., 2018), Singapore (Lee et al., 2014), construction accidents investigation in the United Kingdom (Oswald et al., 2015), and European countries (Shepherd et al., 2021). Researchers claimed that the language barriers were the main concern among foreign workers where they own insufficient safety related information and protection for safety work operation (Guldenmund et al., 2013).

The current Japanese laws and regulations system do not assume that there are foreigners. The Japanese general contractors are torn into two different ways of thinking. It is essential to understand the local language to ensure safety on site, therefore the certification examinations and classes should be conducted in Japanese language. Foreign workers working in Japan must follow all Japanese rules and are familiarised with everything that is done in as short a time as possible, including the local style of work and the importance of doing the work safely. However, the different safety culture and languages of foreign workers could cause inadequate understanding of site rules and regulations. There are several challenges on safety associated with the foreign workers which encountered to foreign workers' safety-related attitudes and behaviours, language issues relating to training were identified by the researchers (Shepherd et al., 2021). It is important to have knowledge about safety. It is better to conduct multiple languages for qualification tests so that the foreigners are able to sit for the tests and classes in their native language to strengthen the relevant skills and knowledge. However, human factors

in safety turn into an issue that has been identified to cause management failure (Chan et al., 2022). Various studies introduce effective site safety programs to address human factors as it is closely related to workers’ safety behaviours (Guo et al., 2017; Li et al., 2018a).

5.2 Construction On-site Practices between Japan and Malaysia: Similarities and Differences

There were found several similarities and differences in safety practices between Japanese contractors’ construction sites in Japan, Japanese contractors’ construction companies based in Malaysia and Malaysia contractors’ construction sites via on-site observation and interviews. The table below shows (Table 5.3) the on-site practices between both nations. The comparison items were selected based on Table 5.1 with the common practices in Japanese contractors’ construction sites. The comparison showed the common practices of on-site safety measures in Malaysia’s construction sites including the use of PPE to individuals; morning assembly with all workers; toolbox meeting; verbal explanation on site safety rules and project information with the aid of videos, power-points, texts and pictures for workers. In terms of on-site facilities, most contractors in Malaysia prepare smoking areas for construction workers and post safety notices in the smoking areas, provide safety signage, information notices in multiple languages, and icons and symbols, and provide safety information with easy-to-understand content in a prominent location on-site, which are the basic requirements for construction sites. More in-depth safety measures like those in Japanese construction sites do not work in Malaysian construction sites. Construction sites in Malaysia are dominated by foreign workers. The above practices currently prevalent in Malaysian construction sites may be attributed to the influx of foreign workers who come from different backgrounds and have different levels of education, which have acted as barriers to the implementation of site safety measures that are as comprehensive as those in Japan.

Table 5.3: Similarities and differences on-site safety measures in Japan and Malaysia

Practicing on-site ("/"); Not practicing on-site ("X") based on the outcomes by on-site observation and interviews	Cluster 1	Cluster 2	Cluster 3	Malaysian construction sites current practices
Personal Protective Equipment (PPE) provided to individual	/	/	/	/
Facial recognition system for body temperature checking at registration station	/	X	X	-
Safety colour (changed every week, subject to the contractor site teams' decision) for body life-lines and hooks	/	One company only	X	-
Morning ritual / assembly with all workers	/	/	/	/
Warm-up exercises before commencement of work	/	X	X	-
Toolbox meeting	/	/	/	/
KY meeting	/	X	X	-
KY safety manual (form to be filled by subcontractors or representative)	/	X	X	-
Risk prediction activity by trades, recorded in hardcopy	/	X	X	-
Call out slogans "spiritual shouting" at the end of each meeting to build a sense of solidarity and remind each other that work operations must be safe	/	X	X	-
Newcomer safety education /safety briefing				
Newcomer safety education for workers reporting himself first day on site	/	X	X	-
Body health checking for newcomers including blood pressure on sites. Body condition will be recorded and kept on site at the office.	/	X	X	-
Verbally explanation safety rules, project information and provide power-point, videos, pictures, texts and hand-out materials	/	/	/	/
On-site facilities				
Worker restroom with digital monitors to display safety information with easy understanding contents	/	X	X	-
Smoking area with safety notices	/	/	/	/
Safety sign boards, information notices with multi-language and icons and symbols	/	/	/	/
Safety information (i.e., posters) with easy understanding contents displayed in a prominent position	/	/	/	/
Special cabinets to store machinery and tools to prevent fire event	/	X	X	-
Wasted materials storage area with labelled	/	X	X	-
Disaster and accident calendar / notices boards (renewal period might be varied)	/	X	X	-
On-site communication tools /devices and platforms for safety concerns (internal usage only)	/	X	X	-
Establish site safety committee among subcontractors with all trades	/	X	X	-
Reporting safety issues with photos and comments immediately via platforms that everyone can access	/	X	X	-

Obtain permission to work at high-risk platforms with supervision	/	X	X	-
Provide safe use manual of dangerous materials (flammable) to workers	/	X	X	-
Internal system for all subcontractors to request access to plant and machinery as well as access routes and entrances	/	X	X	-
Safety evacuation drilling exercises (internal period can be varied)	/	/	/	/
Safe Work Cycle	/	One company only	X	-
Daily, weekly and monthly meeting schedule on safety according to safe work cycle	/	X	X	-
Operation of patrol system	/	X	X	-
Uniqueness of safety measures for foreign workers on sites (by voluntarily)				
Provide hand-out materials of safety education with multi-languages to suit the new foreign workers who come from different countries	/	X	X	-
Verbally explain safety rules and regulations, project information and provide power-point, videos, pictures and texts in multi languages.	/	/	/	/
Create dramatic style videos (non-verbal), contents of the safety precautions change with the seasons. The videos repeated daily without interruption in the workers' restroom.	/	X	X	-

Legend: Cluster 1: Japanese contractors' construction sites in Japan, Cluster 2: Japanese contractors' construction sites based in Malaysia, Cluster 3: Malaysian contractors' construction sites in Malaysia

There were several similarities between construction sites managed by Japanese contractors' construction companies in Malaysia and Malaysian contractors' construction companies in Malaysia were explained. The on-site safety measures managed by Japanese contractors' construction companies in Malaysia were shown with the aid of on-site photographs (Figures 5.14-5.17). Although the common practices adopted by Japanese contractors in Japanese construction companies in Japan are not comprehensive in Japanese contractors' construction companies in Malaysia, this may be due to the cultural and enforcement policy differences. Construction sites managed by Japanese contractors in Malaysia appear to be "free-style" rather than organised. For instance, the workers quarter appears to be on-site allowed workers to rest; the proper material storage area does not appear on-site, the wasted materials and used materials were placed randomly on-site. In terms of workers' safety concern, the safe work cycle was implemented on-site; most expatriate workers were fluorescent vests, long-sleeves, jeans, boots and safety helmets on-site (regardless of the type of work they do), but it is obvious to notice that

most expatriate workers wear an extra layer of headscarf or cloth under their safety helmet to prevent sweating, especially when working in the hot sun. This practice was not reprimanded by any of the site managers or supervisors, but more like a tacit acceptance of such behaviour. Although the safety signages, labels and information were affixed to temporary barriers near heavy machinery operations and lifting operations, indicating the names and contact numbers of the workers in the work area, the cleanliness of the site could be improved.



Figure 5.14: Site cleanliness managed by Japanese contractors in Malaysia



Figure 5.15: Safety signage and labels nearby operation working areas



Figure 5.16: Workers' quarter on-site



Figure 5.17: Safe work cycle and monthly colour code implemented on-site

5.3 Perspectives towards Current Safety and Health Related Issues in Construction Industry

Although Japan's restrictive immigration policy could make it difficult to attract foreign workers and it might undermine the country's economic growth, it is undeniable that the Japanese government is still very keen and strict on the skills training of foreign workers and their continued technical upbringings. Although the skill training is given to the workers, yet, there is no test or assessment after the training or education session, which is a challenge to know whether the workers, especially the newcomers understand the safety knowledge and are able to retain the related knowledge after the training. Therefore, supervision and monitoring are important to be carried out regularly by the sub-contractors and general contractors on site.

However, construction accidents seem to have increased in recent years. Are the current safety practices, safety education and training effective among the foreign workers? Is the Japanese construction industry facing any issues or challenges with foreign construction workers? In this case, the following sub-chapter aims to find out the insights and challenges of foreign construction workers in both nations from the perspectives of government agencies and construction site personnel who work at managerial level in the construction industry, to compare the construction site safety management practices focused on foreign construction workers in Japan and Malaysia.

The aim of this chapter is to explore insights of site safety measures on Japanese construction sites through the perspectives of construction safety experts. *“Qualitative method seeks to find out why things happen as they do, to determine the meanings which people attribute to events, processes and structures to investigate aspects of their social world.....to determine their impacts on behaviours and project performance”* (Fellow and Liu, 2022). Therefore, a qualitative approach has been used to obtain more realistic content and information. Although the qualitative method has been less common use compare to other scientific methods, it is able to recognize the meaning of that individuals or groups to social or human problems (Creswell, 2014), especially focus is on the construction safety (Oswald et al., 2018; Oswald et al., 2019). Observations and

semi-interviews which know the common data collection approaches in qualitative methods (Fellows and Liu, 2008). Generally, the methods of collecting data can be categorised into one-way and two-way communications. Two-way communication is non-linear data collection, provides feedback and gathering of further data via probing and includes semi-structured interviews (Fellow and Liu, 2008). The information was obtained as an observer participated in the activities at the site, interacting and communicating with the staff at the site (Creswell, 2014).

The selected construction sites in Japan and Malaysia were based in the scales in both nations. For instance, the selected construction sites in Japan and Malaysia were the top ten (10) construction companies (as per 2022), respectively. Three (3) Japanese construction sites in Japan, three (3) Japanese construction companies based in Malaysia, three (3) Malaysian local construction sites and one (1) Malaysia construction company, one (1) Malaysia local research institute, three (3) research institutes and agencies, and one (1) skill training centre in Japan were visited personally with the lead of site staffs and colleagues, and records the necessary information based on the safety measures conducted by each corporation on sites via semi-structured interview and on-site observation. The experts had a wealth of experience in the construction industry, therefore, two-way communication enabled in-depth information and perspective to be gained (Table 5.4).

Table 5.4: Background of interviewees

No.	Expert	Position	Working at	Year of industry experience	Group
1	A	Safety related specialist	National Institute of Occupational Safety and Health (NIOSH)	> 20 years	1
2	B	Director of Technical Management	Japan Construction Occupational Safety and Health Association (JCOSHA)	> 20 years	
3	C	Director	Foundation of International Transfer Skills and Knowledge in Construction (FITS)	> 20 years	
4	D*	Deputy Project Manager	Japanese Construction site	> 15 years	2
5	E*	General Manager of Labour Policy Division	Japanese Construction site	> 15 years	
6	F*	Construction Project Manager	Japanese Construction site	> 15 years	
7	G	Construction Project Manager	Malaysian Construction site	< 15 years	
8	H	Construction Project Manager	Malaysian Construction site	< 15 years	3
9	J*	Construction Site Engineer	Malaysian Construction site	< 10 years	
10	K	Managing Director	Malaysia construction company	< 15 years	
11	L	Managing Director	Japanese construction companies based in Malaysia	< 20 years	
12	M	Project Director	Japanese construction companies based in Malaysia	< 20 years	4
13	N	Managing Director	Japanese construction companies based in Malaysia	< 20 years	
14	P	Researcher	Local Research Institute in Malaysia	< 20 years	
15	Q	Executive Director	Training Centre A	> 20 years	

*Observation only (with unstructured interviews and conversation)

5.3.1 Interview Sessions

The interviews were conducted in 2022 and 2023 and each interview session was scheduled for a period of 45 minutes to 2 hours. Each interview is carried out with the individual respondents one-at-a-time to obtain in-depth information. A semi-structured interview used the same predetermined list of questions with the interviewees in Group 1 to Group 3 (selected interviewees from these groups due to willingness). The safety experts in Group 1 provided point of view from government agencies; while interviewee C provided information on the consultation platform to foreign workers and accepting construction companies.

5.3.2 Interview Question Designs

The interview questions were designed based on the current trend of construction safety scenarios focused on foreign workers. Several questions related to the general point of view towards the construction safety and health issues towards foreign workers and the construction safety training materials on foreign workers.

5.3.3 On-site Observation Sessions

The on-site observation and semi-structured interview were conducted with construction site operational management personnel in Group 2 (Observation and unstructured interview and conversation only for sites under Expert D, E, F, J) each on-site observation was scheduled to a period of 4 to 5 hours, one-at-a-time to obtain in-depth information. The duration of the observation to the training centre was 2 days which was located at Fuji. The authors participated in the activities in the training centre (Interviewee Q under Group 4) for the entire day to observe the activities carried out by the participants in the central. Most of the participants are local Japanese, where the teaching medium and materials are fully in Japanese language only. An informal interview was conducted with the director to obtain information on the skill training contents. The author has obtained official permission from these construction sites and companies to use photographs and videos of the sites and all information used in this paper is for academic research purposes only. The outline was focused on different groups as shown in Figure 5.14.

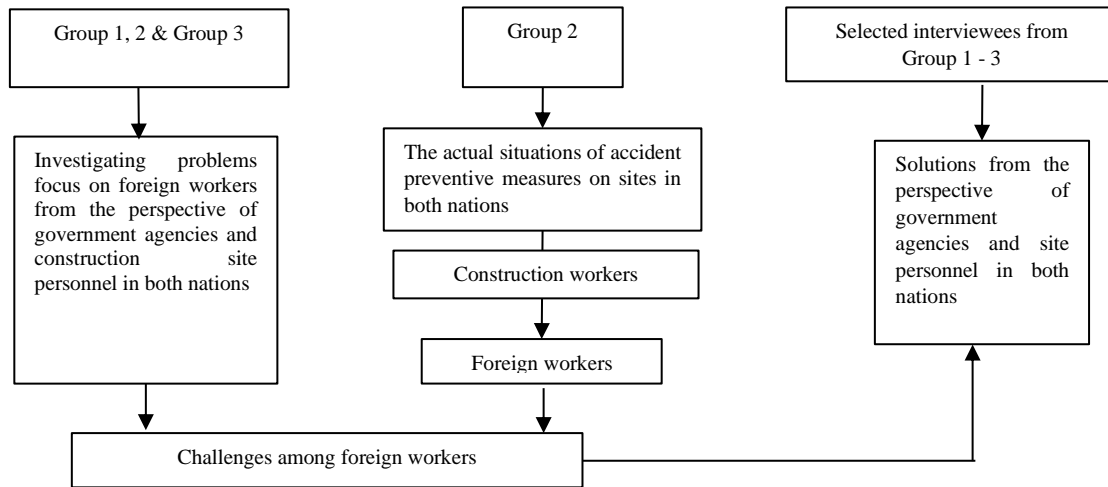


Figure 5.14: Outline of the study

Interview questions and responses from the respective experts and construction personnel were indicated in the following tables.

Table 5.5: The characteristics of foreign construction workers in the eyes of the selected interviewees.

No	Characters	Toward Japanese construction workers				Toward Malaysian construction workers			
		A		B		G		H	
		Local workers	Foreign workers	Local workers	Foreign workers	Local workers	Foreign workers	Local workers	Foreign workers
1	Work attitude	Moderate	Moderate	Satisfied	Satisfied	Satisfied	Moderate	Satisfied	Moderate
2	Safety knowledge	Moderate	Moderate	Satisfied	Satisfied	Moderate	Not satisfied	Moderate	Moderate
3	Communication skills	Satisfied	Not satisfied	Satisfied	Not satisfied	Moderate	Moderate	Moderate	Moderate
4	Safety awareness	Satisfied	Not satisfied	Satisfied	Satisfied	Moderate	Not satisfied	Moderate	Moderate

Comments from the interviewees towards the above characteristics:

A: *"In Japan, the foreign workers are normally recruited by different trades of sub-contractors, while the main/principal contractor is not in-charge for foreign workers. The principal contractors or the representatives will directly deal with the representative / Head of subcontractor (different trades) to discuss the foreign workers issues for*

solutions. Besides, the sub-contractors are unable to recruit many foreign workers in their company due to the small scale (it can be 1 foreign worker to be recruited annually or longer time to recruit one foreign worker), it leads to the foreign workers were unable to join the local workers (due to minority, language and culture issues), lead to loneliness problems, feeling being isolated. These can lead to ineffective communication among the workers (local and foreign workers) during operation.”

B: “Personally, it depends on each character, work attitude, physical ability (competency) rather than local or foreign.”

G: “In Malaysia, local workers are mostly old age or senior age in construction sites, the working attitude is more on working experiences, indeed, sometimes they will show an attitude of “take advantage of one’s seniority” by ignoring manners or regulations to the young workers or young supervisors. The safety awareness and knowledge are difficult to judge based on their working attitude, yet minor accidents such as cutting his hands/fingers or tripping were quite often occurring on site. Foreign workers are requiring more attention in terms of work safety on site.”

H: “Local workers’ work attitudes are satisfied so far, the working attitude is quite professional on working experiences, some of the young workers are passionate even though they are new to the field, they are willing to learn from their counterparts and seniors. Some foreign workers' working attitude is stubborn, maybe because they are not familiar with the environment and their counterparts. Foreign workers are requiring more attention in terms of work safety on site. Overall, the foreign workers are humble and willing to learn.”

Expert P: “The current situation of the involvement of foreign construction workers who came from Myanmar and Bangladesh is increasing, they are unskilled and only can work as general workers that leads to low wages, the same situation back to 20 years ago. Almost all industries in Malaysia are in need of foreign workers either legal or illegally, there are many foreign workers who are undocumented, the Malaysian government is unable to provide the accurate numbers of foreign workers in the country. However, the Malaysian government does not provide safety training or skill training for foreign workers as it is not mandatory or there is no enforcement from the government.”

5.4 Perspectives of Government Agencies towards the Current Safety and Health Management in Japan

In Japanese construction industry:

Table 5.6: Perspectives of government agencies towards current safety and health management in Japan

Perspectives towards	Expert A	Expert B
the current safety and health issues in Japanese construction industry	Due to Japan's ageing population and declining population, foreign workers are needed to fill the labour shortage. However, foreign workers are less sensitive to safe construction, which is a rather tricky issue.	Worker accidents are increasingly caused by factors such as elderly workforce, shortage of skilled workforce and increasing human factor related accidents.
construction accident occurrence and problems specific to foreign workers	-Insufficient of construction safety awareness, -Communication problem due to different language, not proficiency of Japanese language and due to minority, which created loneliness, -Insufficient understanding towards safety site rules and safety cultural differences on site.	-Not proficient in Japanese language and Japanese work practices are the current problems that require appropriate solutions and effective occupational safety and health education.
the current safety education effective for foreign workers	The current safety education for foreign workers can be claimed as failed. The current major problem is how to improve the safety education for safety law and regulations to be applied into the site safety management effectively as the current practice provides theory only to the foreign workers, lack of hands-on practising among the workers under the training session and no assessment after training.	The foreign workers are obligated to obey such safety education using understandable content to call their attention with illustrations and their native languages on site, however, the communication skills between co-workers are significant to be solved, and can only be effective to foreign workers.
Which teaching methods for safety training effective for foreign workers	Sharing Digital Video Disc (DVD) with or without texts and words and providing discussion are common use in the Japanese construction industry. However, using Virtual Reality (VR) and providing hands-on practice should be effective for foreign workers.	Sharing Digital Video Disc (DVD) with or without texts and words can be effective if the purpose of the safety training is clear. However, using Virtual Reality (VR) and providing hands-on practice should be effective for foreign workers.
How the safety training materials (lecture and videos) to be useful for foreign workers	The combination of different materials to be used is the effective way to train workers, for instance, use the low engagement training to provide basic theory and information > using VR > carry out discussion based on the contents learnt > to provide prevention and	The workers took low engagement safety training materials such as videos and lectures seriously in general, as the workers were pleased to obtain certificates of the safety training after the low engagement safety training, it seems to be effective for the workers who attend the safety training.

	solution based on the worker's feedback.	
Confirmation on the level of understanding after the safety training among foreign workers	There are no tests or assessments for workers after the safety training. Observation from the supervisors on sites is the current practice to look over the worker's working behaviours.	Daily checking via observation by foreman and site manager to continuously confirm whether the workers work properly and safely as on-job training (OJT) in line with the safety work cycle.
whether foreign workers to be ready to use in construction site with the current construction safety education	The current safety training is lacking hands-on practices, and there is no proper assessment or evaluation to know about whether the workers are truly understanding towards the safety training and the safety site rules.	The current problem is not entirely safety education, but rather a lack of effective communication. It is therefore essential to increase daily mutual communication between workers' superiors and colleagues in order to gain their recognition.
The barrier(s) to implement the safety training to the foreign workers	The safety guidelines were not compulsory to be followed at all the construction sites.	Lack of effective communication due to human factors from the foreign workers is the current issue.

5.5 Perspectives of Construction Personnel towards the Current Safety and Health Management in Japan and Malaysia

In Malaysian construction industry:

Table 5.7: Perspectives of construction site personnel towards current safety and health management in Malaysia

Perspectives towards	Expert G	Expert H
the current safety and health issues in Malaysian construction industry	Low safety awareness on site, there is not such a safety environment or safety culture on site.	Current issues such as shortage of unskilled workers, too many illegal workers, lack of safety awareness. Many site workers, happy with the old ways of doing things, do not opt for improvement especially in smaller projects, contractors won't do anything until told to do so by DOSH; low-cost labour solutions are preferred.
construction accident occurrence and problems specific to foreign workers	-Insufficient of construction safety awareness, -Insufficient understanding towards safety site rules and safety cultural differences on site. "The level of literacy among the foreign workers is way too poor. Most of them do not receive any proper education in their hometown, only very few of the foreign workers received education, some graduated in their homeland before work in Malaysia construction site. Not to mention the relevant skills, most of	-Insufficient of construction safety awareness, -Insufficient understanding towards safety site rules and safety cultural differences on site. "The level of literacy among the foreign workers is way too poor. The understanding of instruction is one of the critical problems that might lead to accidents on site. Most of them do not receive any proper education in their hometown before work in Malaysia construction sites. Not to mention the relevant skills, most of the

	the foreign workers do not receive proper skill and techniques training or programme before joining the construction companies. Most of the foreign labourers learn the skills on site with the senior's labour. This is the norm in most construction sites, especially small and medium companies. Language is not the main issue; however, the understanding of instruction is one of the critical problems that might lead to accidents on site."	foreign workers do not receive proper skill and techniques training or programme before joining the construction companies. Most of the foreign labourers learn the skills on site with the senior's labour. This is the norm in most construction sites."
the current safety education effective for foreign workers	The education for new workers (at the time of employment), safety education before assignment to construction sites, correct work procedures, education of unsafe acts, safe usage of tools and machinery, information sharing (case studies and discussion) are believed to be effective for foreign workers.	The education for new workers (at the time of employment), toolbox meeting, dangerous materials and machinery education, safety usage of tools and machinery, education on risk recognition, education of unsafe acts, safety education before assign to construction sites, education when changing works or tasks and correct work procedure are believed to be effective for foreign workers.
Which teaching methods for safety training effective for foreign workers	Normally, lectures or playing videos and group discussion (verbally) to the workers are easy to carry out on site for the workers. VR or other advanced technologies might not be available on site due to budget issues, also, safety is not a priority than production.	Lecture class or video demonstrations for the workers including the foreign workers are still very popular and common here, pictures and videos are easy for them to visually understand the information. I know advanced technology is very useful and already implemented in some countries. However, advanced technologies might not be available on site due to budget issues.
How the safety training materials (lecture and videos) to be useful for foreign workers	I personally think that handouts will be useful for local workers who can read and understand the information; normally, we will only provide videos, PPT or verbal discussion among all the workers if necessary. Verbal discussion is easier. Also, there are always a large number of foreign workers on sites, the effective way to give instruction or tasks is using verbal, to save time. It is difficult to judge, the current safety training is poor as it is not compulsory to implement for construction workers. However, I personally think that the understanding of the work procedures and wearing PPE all time are the most important, at least the workers can protect themselves from accidents.	Handout is common and easy to handle and able to point out the critical information and updates during the meeting discussion. In addition, verbal discussion is also common and straightforward to the workers. However, verbal instruction can be very ambiguous, workers might not take it seriously. There are always a large number of foreign workers on sites. The current safety training materials are basic, and to be honest, those safety contents might be outdated. The training program organised by agencies, or some institutions is not free of charge, it requires fees, some companies do not have the budget for it, and government subsidiaries are not sufficient for all construction companies.

Confirmation on the level of understanding after the safety training among foreign workers	Personally, foreign workers are having poor performance in safety due to lack of proper training and awareness. We cannot confirm whether they can understand the importance of work safety on site. Some of the foreign workers are very stubborn, and they are not afraid of being injured or involved in accidents. However, via observation and supervision, we can at least remind them if they are performing unsafe behaviours. I think the most important thing is to enhance the feeling of danger on site, and increase their awareness.	Personally, we do not really check the understanding after the training, all based on the certificates approved by the agencies. However, supervision is still our thumb of rules, and we will discuss the working procedures during the meeting.
whether foreign workers to be ready to use in construction site with the current construction safety education	Not ready, but we have no choice since the construction industry in Malaysia is heavily dependent on the foreign workforce.	
The barrier(s) to implement the safety training to the foreign workers	The enforcement of regulations is less effective, especially come to the safety skills or techniques among the foreign workers. The foreign workers are mostly “copying or imitating” others during the operations (lack of awareness of safety), and these actions might be unsafe behaviour, but they do not recognize it. Lack of effective communication, lack of budget allocation for safety related programmes and prioritisation of production over safety.	

5.6 Safety Training Contents based on the High-risk Activities: To Address the Critical Construction Fatal Accidents

5.6.1 Table 5.8: Summary of the perspectives from the selected interviewees towards safety training activities for foreign workers

	A	B	G	H	K	L	M	N	frequency	Consideration
Effective safety activities towards foreign workers										
Education for new workers (at the time of employment)			/	/			/	/	4	moderate
Safety education before assign to construction sites		/	/	/	/		/	/	6	critical
Education when changing works/tasks				/			/	/	3	Not so critical
Foreman education		/				/	/	/	4	moderate
Special education stipulated by law							/	/	2	Not so critical
Information sharing (case studies and discussion)			/		/	/	/	/	5	critical
Correct work procedures			/	/	/	/	/	/	6	critical
Toolbox meeting				/	/		/	/	4	moderate
Dangerous materials and machinery education	/			/		/	/	/	5	critical
Safe usage of tools and machinery	/		/	/		/	/	/	6	critical
Communication skills between co-workers		/				/	/	/	4	moderate
Education on risk recognition				/		/	/	/	4	moderate
Education of unsafe acts	/	/	/	/	/	/	/	/	8	Most critical

5.6.2 Table 5.9: Summary of the perspectives from the selected interviewees towards the barriers to implement such safety training to workers and the critical improvement for foreign workers in both nations.

	A	B	G	H	K	L	M	N	frequency	Consideration
Barriers to implement safety training to workers										
Lack of technical support by consultants								/	1	Not so critical
Lack of awareness of OSH relevance by workers	/		/	/		/	/	/	6	Critical
Inadequate OSH policy								/	1	Not so critical
Inadequate dedication of time		/				/		/	3	Not so critical
Lack of effective communication	/	/	/	/	/	/	/	/	8	Critical
Prioritisation of production over safety		/	/	/		/	/	/	6	Critical
Lack of budget allocation for OSH programme		/	/	/				/	4	moderate
Critical improvement for foreign workers										
Improvement of safety and health system/law			/	/	/	/		/	5	Critical
Improvement of language ability	/	/	/	/	/	/	/	/	8	Critical
Improvement of construction safety skills						/	/	/	3	Not so critical

5.6.3 Table 5.10: Summary of the perspectives from the selected interviewees towards safety training contents / programmes need to be improved for foreign workers.

	A	B	G	H	K	L	M	N	frequency	Consideration
Safety training contents/programme need to be improved										
Special education on fall prevention (PPE)	/		/	/	/		/	/	6	Critical
Special education on Scaffolding			/	/			/	/	4	
Special education on slinging operation	/		/	/	/		/	/	6	Critical
Skill training on driving construction machines/vehicles							/	/	2	
Skill training on welding							/	/	2	
Skill training on slinging work	/						/	/	3	
Foreman education							/	/	2	
Safety and health training (when changing work)								/	1	
General education on work procedures	/	/	/	/	/	/			6	Critical
General education on safety rules		/	/	/		/			4	
General education on signs and notices		/	/	/		/			4	
General education on technical terms		/	/	/		/			4	
General education on culture and customs		/	/	/		/			4	

5.6.4 Table 5.11: Summary of the perspectives from the selected interviewees towards teaching methods for safety training effective for foreign workers.

	A	B	G	H	K	L	M	N	frequency	Consideration
Teaching methods for safety training effective for foreign workers										
Lecture only					/	/			2	
Lecture and comprehension test			/	/					2	
Sharing videos by DVD			/	/	/	/	/	/	6	Effective
Sharing videos by DVD and discussion	/	/	/	/	/			/	6	Effective
Using Virtual Reality (VR)	/	/				/		/	4	
Using VR and hands on practices	/	/				/		/	4	
Group discussion								/	1	

5.6.5 Table 5.12: Summary of the perspectives from the selected interviewees towards teaching materials for safety training effective for foreign workers.

	A	B	G	H	K	L	M	N	frequency	Consideration
Teaching materials for safety training effective for foreign workers										
Handout in text form									0	
Handout in full translation teaching materials into various languages			/	/	/			/	4	
Video by DVD (without text and words)	/	/	/	/	/	/	/	/	8	Effective
Power Point (with pictures, texts in one language)								/	1	
Power Point (with pictures, texts in different languages)		/	/	/				/	4	
Sharing information (verbal discussion in one language)		/						/	2	
Sharing information (verbal discussion in different languages)			/	/	/	/		/	5	

5.6.6 Table 5.13: Summary on the perspectives from the rest of the selected interviewees for three questions.

Perspectives towards	A	B	G	H	K	L	M	N
Safety problems associated with foreign construction workers	Insufficient of construction safety awareness, communication problems, insufficient site rules, safety culture differences	Insufficient of construction safety awareness, safety culture differences	Insufficient of construction safety awareness, communication problems, safety culture differences	Insufficient of construction safety awareness, communication problems, safety culture differences	Insufficient of construction safety awareness, communication problems, safety culture differences	Insufficient of construction safety awareness, communication problems, insufficient safety site rules, safety culture differences	Insufficient of construction safety awareness, communication problems, insufficient safety site rules, safety culture differences	Insufficient of construction safety awareness, communication problems, insufficient safety site rules, safety culture differences
How to check the level of understanding after safety training among foreign workers	Observation from the supervisors on site	Test and assessment, daily checking by observation from site manager/foreman	Conduct physical test on site	Observation and physical test on site	Checklist after the induction	On-the job training is fundamental after on-site entrance safety training, safety training is provided on a regular basis	None	Provide safety training frequently.
How to make sure foreign workers understand the safety policy and obey it	Mutual understanding between co-workers to enhance two-way communication and understanding	Daily voluntary participation to safe work cycle	Implement penalty system	Implement penalty system	Safety committee meeting (monthly basis), toolbox meeting and penalty in terms of monetary fine	Provide safety training and noting on any unsafe acts found on site. Warning will be given to those who do not comply, rejected to enter the site if repeating the same unsafe acts.	The fining system is effective	Remind workers of the importance of safety such as small hand books, weekly and monthly safety patrol, yearly safety assembly and all workers.

5.7 Solutions: Perspectives from the Selected Interviewees

The discussion further elaborates the solutions from the perspectives from the selected interviewees from government agencies and construction personnel in both nations to tackle the safety issues focused on foreign workers. There are three issues to be elaborated respectively.

Issue 1: Insufficient of skills techniques among foreign workers

Japan has experienced severe labour shortages especially in the construction industry; most of the foreigners willing to work as blue-collar workers are from developing countries who are unskilled. In Japan, unskilled blue-collar workers are not accepted by Japanese employers or companies and are prohibited to enter Japan as employees. Therefore, the Japanese government launched a technical trainee program as a main avenue for blue-collar workers mainly for foreign workers to enter Japan. However, the insufficient skill techniques were found in foreign workers who are young without experience and skills. Furthermore, the foreign workers are mostly unfamiliar with the Japanese style work practices on site. Therefore, send out to proper and professional skill training centres, trained by experienced local workers with the local working style to enhance the skills among foreign workers.

The JCOSHA holds a wide range of training courses such as skill training based on the Industrial Safety and Health Act, education on safety and health based on notifications issued by the MHLW and instructor training courses for internal education held by enterprises. The courses include those related to COHSMS; training for safety and health staff and construction engineers, instructors in safety and health education are designed to ensure the methodical and systematic promotion of safety and health management in the construction industry. In addition, JCOSHA emphasise the key safety points for safety training and launched the safety and health training for foreign construction workers in multiple languages. The relevant safety and health training information including videos demonstrations, theories and safety related knowledge are available online and JCOSHA provide to the construction company without charges.

There are several other facilities established by private companies such as general

contractors to provide skills training to construction workers in Japan. However, there are only two public skills training facilities in Japan and Fuji Construction Training Centre is one of it, jointly established by the Ministry of Land, Infrastructure, Transport and Tourism and the MHLW to provide a short duration of skills training to construction workers, mainly for young people who are newly recruited to the construction industry. The main purpose of the centre is to assist the technical trainees to obtain qualifications and licences stipulated by safety and health laws and regulations. The skills training contents include general theory on construction, reinforcement bar training, safety and health training, scaffolding training, etc. The centre provides accommodations and facilities to participants during the short courses, subjective to the course contents. The same content is also available for training courses for foreign trainees. The construction workers who participated in the training centre were able to learn the knowledge and perform hands-on practices. This has undoubtedly greatly increased the familiarity of construction workers with operational work. However, the teaching medium by the local Japanese is in Japanese language only.

In Malaysia, the skills training and safety training for foreign workers is not mandatory or by enforcement from the government. The construction companies do not allocate a budget for safety related training due to it not being mandatory by the authorities. In addition, the level of awareness toward safety is low in Malaysian context, whereby they believed the foreign workers could learn from the others (learn on the spot) during operation.

Issue 2: Ineffective communication due to language barriers between foreign and local workers and superiors

Most of the new entrant foreign workers are young people who might not be able to mix with senior workers due to being a minority; and their Japanese language is not proficient enough to allow them to communicate with local workers.

Both experts provide their perspectives towards the solutions. Expert A mentioned that the critical improvement for foreign workers must done by the main contractor who

should have someone who can speak foreign language on-site to perform communication with foreign workers effectively; on the other hands, the foreign workers should master the Japanese language to make better communication among the local workers and supervisors on sites, so that, the foreign workers able to articulate the issues or problems found on-site to their supervisors to create safe working environment. Mutual understanding and two-way communication between foreign workers and local workers are important to solve the problems. Expert B mentioned the communication skills between co-workers is the significant issue to be solved. Mutual repeating communication and discussion are both important for local and foreign workers to understand why and how to do their tasks safely and smoothly. The senior workers should contact the foreign workers with ease to perform better understanding between each other. Daily voluntary participation in the safety work cycle is essential and encourages their foreman and site manager on how to support and approach them generously with warm hearts, sometimes in strict ways.

In Malaysia, the level of literacy among the foreign workers is way too poor. Most of them do not receive any proper education in their hometown, only very few of the foreign workers received education, some graduated in their homeland before work in Malaysia construction site. Not to mention the relevant skills, most of the foreign workers do not receive proper skill and techniques training or programme before joining the construction companies. Most of the foreign labourers learn the skills on site with the senior's labour. This is the norm in most construction sites, especially small and medium companies or in the construction sites that hire temporary workers who are probably an undocumented worker.

Issue 3: Inadequate understanding of site rules and regulations in the context of the different safety culture of foreign workers

The construction workers are found to be careless and pay less attention to safety where they might have insufficient safety awareness while operating daily tasks on site, especially to foreign workers. The fundamental safety education is sufficient for foreign workers to learn Japanese working style, habits, customs, etc., the safety education and

foreman education prior to assignment to the construction site should be reinforced is important, followed by education on unsafe behaviour in order to effectively consolidate the safety culture. In addition, the safety training contents shall be based on the hazardous level (e.g., Risk hierarchy) because there are too many risks, which is very difficult to teach every single risk during the safety training, on the other hand, it is impossible to be that detailed. Therefore, enhance the supervision and observe the worker's performance whether it is correct or wrong. Correction and explanation will be given if the workers' behaviour is improper. Foreign workers have to be aware of the risk or hazards on sites, to follow the work procedures strictly and integrate the safety knowledge to work safely is very important.

Besides, to disseminate top-down messages on the "safety first" plan, top management should approach operational workers, always listen to the problems faced by foreign workers. Daily reminder (repetitive reminder) among workers on safe work on sites. Continuously practising SWC two pillar safety management are the key to enhance safety awareness and prevent accidents. To declare the Safety First before anything else by top-down with clear understandable message, under this plan to keep on the safety work cycle by bottom-up voluntary activities toward Plan-Do-Check-Act (PDCA) Cycle stated in the Construction Occupational Safety and Health Management System (COHSMS).

The experts had similar views on safety practices on construction sites and safety education for foreign workers in Japanese construction sites; Expert A and B emphasised that human errors cause accidents on sites, this may be caused by the ineffective communication, different cultures and languages, lack of skills and insufficient safety awareness among the foreign workers. Both advocated improved communication skills (standardised language). Strengthen the enforcement of safety regulations, improve workers' ability to enforce safe hands-on practices and increase safety awareness are urged to prevent accidents. In contrast, Expert G and H emphasises the current loose enforcement toward the recruitment of foreign workers and safety training led to the construction safety issues among foreign workers in Malaysian context is the major issue. However, the basic safety training such as wearing PPE all time and supervision and verbal discussion are sufficient to educate and to train the foreign workers who have low

level of literacy to work safely during operation.

In Malaysia, the foreign workers are mainly from neighbouring countries namely Indonesia and Bangladesh, these foreign workers can speak basic Bahasa Malaysia during operation. Simple communication is not an issue for simple instruction; however, the awareness of safety is still low among these workers. Therefore, to enhance the safety awareness, proper safety training methods and materials must be effectively provided to these workers.

The interviewees and the construction corporations visited by the authors strictly followed the rules and regulations stipulated by the government. There are few safety measures for foreign workers in the initiatives of general contractors and construction sites themselves. Nor are there any legal measures to manage the safety of foreign workers. The existing regulations provide minimum standards for all workers, yet, the current regulations do not consider foreign workers in the Japanese and Malaysian construction industry. By voluntarily, the contractors initiated several measures to tackle the problem faced by the foreign workers on sites (Table 5.14).

Table 5.14: Challenges and solutions

Perspectives towards	Challenges towards foreign construction workers	Solutions
Japanese construction scenarios	Insufficient of skills and techniques Ineffective communication due to language barriers Inadequate understanding of site rules and regulations in the context of the different safety culture	Send out to proper / professional skill training centre Enhancing Japanese language with two-way communication Disseminate top-down message on “safety first” plan
Malaysian construction scenarios	Insufficient of skills and techniques Ineffective communication due to low level of literacy and language barriers Inadequate understanding of site rules and regulations in the context of the different safety culture	Strengthen the enforcement on skills and safety training Provide easy and basic safety training to foreign workers by voluntary Repetitive reminder to workers on safety

5.8 Considerations

From the above findings and perspectives, foreign construction workers in the construction industry are less satisfied, especially toward their ability in communication skills, low level of safety knowledge and safety awareness in both nations regardless of their nationalities due to different cultural and language barriers. In particular, both countries still require a large number of foreign labour force to develop their construction industry at a time when the ageing of the population is increasing; when young people are reluctant to join the construction industry and when automation and mechanisation has not yet been able to fully replace manual labour. Due to the critical barriers such as lack of awareness of OSH relevance by workers; lack of effective communication and prioritisation of production over safety to implement safety training to workers in the construction industry, it is imperative to educate foreign construction workers, especially on safety practices, in order to raise their safety awareness. Therefore, from the perspectives of government agencies and construction site personnel in both nations, the safety training must not be neglected among the foreign construction workers. The effective safety activities toward foreign construction workers are education of unsafe acts; safety education before assignment to construction sites; information sharing (case studies and discussion); correct work procedures; dangerous materials and machinery education and safety usage of tools and machinery. Since the language ability must be improved in this case, the safety training method must cover the shortcoming of the language barrier. The following summary table showed their perspectives (the terms of “critical” meaning the perspectives are based on the majority of the group of interviewees) towards the questions. The responses to the considerations on the safety training methods and materials can be implemented in both nations to strengthen the safety awareness among the foreign construction workers. The consideration of the critical safety training contents and teaching methods and materials will further examine the usefulness among foreign workers in the next chapter (Table 5.15 and Table 5.16).

Table 5.15: Critical safety training contents/programme need to be improved

Critical safety training contents/programme need to be improved:
Special education on fall prevention (PPE)
Special education on slinging operation
General education on work procedures

Table 5.16: Critical teaching methods for safety training effective for foreign workers

Critical teaching methods for safety training effective for foreign workers:
Sharing videos by DVD
Sharing videos by DVD and discussion
Critical teaching materials for safety training effective for foreign workers:
Videos by DVD (without text and words)

Chapter 6 Safety Training Methods for Construction Workforce

In the previous chapter, the teaching methods and teaching materials for safety training which are effective for foreign construction workers as well as the critical safety training contents required to be improved were identified by the government agencies and the construction site personnel. This chapter aims to examine the effectiveness of which teaching methods are useful to foreign construction workers and construction novices to provide a comparative point of view, regardless of nationality. The teaching contents were selected based on the high frequency of high-risk activities on construction sites. The safety contents used in the study was originally sourced from *Planex*, a Japanese video production company specialising in safety and health awareness materials aimed to reduce the number of workers affected by disasters and accidents that can be used as a reference.

6.1 Research Background

Safety is one of the basic human rights based on the Work Human Rights Declaration (United Nations, 2022) especially in the workplace. Construction industry is regarded as one of the unsafe occupational fields with a complex work environment (Fang and Wu, 2013) and dependent on foreign labour workforce (Ismail et al., 2018) in many countries. It contributed a high rate of 30% of fatal accidents (International Labour Organisation (ILO), 2021) where the construction workers are 3 times more likely than other workers to die from the occupational related accidents (ILO, 2015). Studies showed the fatal accident rate for foreign workers is two times higher than domestic workers in many countries such as Japan, Taiwan (Cheng and Wu, 2013) and Malaysia (Department of Occupational Safety and Health (DOSH), 2016). The construction industry in Japan will account for about 3.48% of foreign workers in 2019 among the total number of employees in the industry and most of the foreign workers are from Southeast Asia. The number of foreign workers involved in the construction industry is on the rise due to the economic growth. Southeast Asian countries that are expected to develop in the future are facing similar challenges. In developing country such as Malaysia is encountered about 70% of construction foreign labours mainly from Indonesia and Bangladesh legal and illegal (Abdul-Rahman et al., 2012) and the unskilled foreign workers is the weakness in exchange of cheaper workforce (Ismail et al., 2018).

Most of the construction accidents occur among foreign workers and young workers (Ajslev et al., 2017; Hanvold et al., 2019) due to unsafe conditions, unsafe behaviours (Cheng et al., 2010; Liu and Tsai, 2012; Li et al., 2015), workers' literacy levels (Bhoir and Esmaeili, 2015), language barriers (Jaselskis et al., 2008; Son et al., 2013; Oswald et al., 2019), involvement of young foreign workforce (Ajslev et al., 2017) and lack of safety training (Priyadarshani et al., 2013; Hargreaves et al., 2019). In other words, construction workers decide how work is jeopardised with their ability to identify potential accidents on construction sites that lead to accidents. Studies showed the fatal accident rate for foreign workers is two times higher than domestic workers in many countries such as Japan, Taiwan (Cheng and Wu, 2013) and Malaysia (Department of Occupational Safety

and Health (DOSH), 2016). In developing country such as Malaysia is encountered about 70% of construction foreign labours mainly from Indonesia and Bangladesh legal and illegal (Abdul-Rahman et al., 2012) and the unskilled foreign workers is the weakness in exchange of cheaper workforce (Ismail et al., 2018). Furthermore, the construction accidents have impacts towards economic and social (Silva et. al., 2013) especially financial losses (Hoła et al., 2016) to repair damages and workers' compensation. Therefore, the safety and health aspects must not be disregarded in the construction industry.

Safety training is very important as a part of the safety climate (Ajslev et al., 2017), especially for those holding high risk hazard construction industries requiring their workers to attend safety training organised by government or special department. However, researchers found out that compulsory training is ineffective as compared to optional training (Curado et al., 2015). Inadequate or insufficient training is often cited as a root cause for many construction accidents and fatalities.

Each country has its own culture and customs; it is important to implement safety education in the receiving country to improve workers' ability in risk recognition (Cheng and Wu, 2013; Albert et al., 2014a). Many countries in Southeast Asia have systems for safety supervision at construction sites, but have not developed regulations for safety training at these sites. Japan is one of the few countries that impose an obligation on general contractors to provide ongoing safety education and training for construction technicians working in the country, and the safety educational content is well-developed. In Japan, the safety and health education must be conducted by the construction companies when engaging workers and it is mandatory to provide said education without delay when there are changes of workers in the construction sites. The safety training for all the contractor's personnel provided by the contractors must be designed in a language which the persons to be trained fully understand as appropriate (clause 1.19 in Japan International Cooperation Agency Standard Safety Specification) (JICA, 2021). Japan enforced the Occupational Safety and Health (OSH) multilingual teaching material and non-verbal OSH teaching materials for workers and foreign workers to promote safety training on site. The employers are obligated to provide safety and health education

related to construction to all workers including new workers and foreign workers stated in the Article 59 of Industrial Safety and Health Act (1972).

The relatively dangerous nature of the construction industry reflected in the accident statistics is well documented. The accident frequency is one of the important indicators of safety and health performance in the construction industry as the economy grows (Teo et al., 2008). For instance, the construction accident rate was recorded 6.27 in 2000 and reduced to 4.48 in 2020; the construction fatalities recorded 34% or 8,964 out of 26,104 total fatality cases caused by construction workers who died at construction sites between 2000-2020 in Japan (JISHA, 2020). The construction accident rate has declined yet the fatalities rate remains high in Japan. This proves the effectiveness of the safety education among foreign workers in Japan which turns into a textbook for developed and developing countries.

In several countries, the most influential driver of health and safety improvement in the construction industry is the legal framework with the specific standards, rules and regulations. Rules and regulations are able to contribute to the aspect of the triple bottom line, yet, some rules and regulations are not well designed to the purposes; and not implemented effectively and efficiently. According to researchers, the compulsory training carried out by Malaysia's National Institute of Occupational Safety and Health (NIOSH) could be effective and able to stimulate OSH implementation among the construction industry (Fardaniah et al., 2018).

6.2 Safety Training provided by NIOSH Malaysia

According to the National Institute of Occupational Safety and Health (NIOSH) Malaysia (2023), training is part of occupational safety and health to ensure the success of any OSH in the workplace. The chairman of NIOSH stated that *“Training is an investment and certain to pay back in the form of increased productivity in conjunction with a safe and healthy workplace environment”*. Therefore, the training should be applicable to managers, supervisors, and front-line workers to allow them to understand how the safety management system works and the legal requirements they require to comply with.

Through proper and effective training, all employees will understand their responsibilities and the necessary actions that they require to take to improve safety and health in their respective workplaces. An adequate and effective training must be provided regularly to all related employees who are responsible for OSH. In other words, the safety training is critical to train all employees to do the right thing in the right and safe way. All the training provided by NIOSH is recognized by the industries internationally.

The current OSH safety training program provided by NIOSH Malaysia is divided into four (4) types namely OSH Practitioners program; Competency / Certificate program; trainer's program and safety passport program. The contents and types of training programs are subjective to the changes of the government policy.

Table 6.1: The contents and types of training program

Program for	Contents
OSH Practitioners	<ul style="list-style-type: none"> -Incident Reporting and Analysis Technique -Emergency Preparedness and Response Plan -Understanding, Evaluating and Implementing effective Hazard Identification, Risk Analysis and Risk Control (HIRARC) at Workplace -Effective Safety and Health Committee -Fundamental Occupational Safety and Health for Supervisor -Ergonomic and Manual Handling at the Workplace -Compliance to Regulations Under OSHA 1994 -Compliance to Factories and Machinery Act 1967 and Regulations
Competency / Certificate	<ul style="list-style-type: none"> -Safety and Health Officer -Site Safety Supervisor -Hygiene Technician 1 -Hygiene Technician 2 -Authorised Entrant and Standby Person -Authorised Gas Tester and Entry Supervisor -Indoor Air Quality for Assessor -Noise Risk Assessor -Chemical Health Risk Assessment -Occupational Health Doctor
Trainer's	<ul style="list-style-type: none"> -Train the Trainer -Training Management for Business -Confined Space Train the Trainer
Safety Passport	<ul style="list-style-type: none"> -Contractor safety Passport System (SCPS) -Expressway Operations Safety Passport (EOSP) -NIOSH NESTLE Safety Passport (NNSP) -Oil and Gas Safety Passport (OGSP) -NIOSH-ASTRO Safety Passport (NPTSP) -NIOSH PORT Safety Passport (NPTSP) -Sarawak Energy Safety Passport (SESP)

	-NIOSH TM Safety Passport (NTMSP) -NIOSH Tenaga Safety Passport (NTSP) -Air Selangor-NIOSH Safety Passport (ANSP)
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(Sources: National Institute of Occupational Safety and Health, Malaysia (2023)
 (Available online at <http://www.niosh.com.my/training>) (Access May 2023)

Besides, there are three (3) courses program trained by registered trainers recognized by NIOSH namely competency program (42 courses), non-competency program (76 courses) and induction and safety passport program (46 courses). The selected details of the program related to construction as follows:

Table 6.2: The program related to construction industry

Competency Programs	Non-competency programmes	Induction and Safety Passport Programme
Authorised Entrant and Standby Person for confined space	Behaviour based safety for observer	Contractor Safety Passport System-All risks
Basic Occupational First Aid	Back protection management	Contractor Safety Passport System-High risk
Basic ringing and slinging	Basic principles of industrial hygiene	Contractor Safety Passport System-Low risk
Crane and machinery safety inspection	Effective communication in OSH	
Construction safety and health trainers	Ergonomics and manual handling in workplace	
Safe handling of forklift truck	Emergency preparedness and response plan	
signalman	Effective safety and health committee	
Safety and Health Officer	Full accident investigation and reporting	
Site Safety Supervisor	<i>Kiken Yochi</i> Training	
Working safely at height	Mental health awareness	
	Understanding, evaluating and implementing effective HIRARC at the workplace	

(Sources: NIOSH, 2023) Available online at <http://www.niosh.com.my/course-programmes#competency-programmes>

In addition, NIOSH and OSH authorities provide a platform of training and certificate examination to the candidates. The following are the list of examinations.

Table 6.3: The list of examination

Non-legal Examination by National Institute of Occupational Safety and Health (NIOSH)	Legal Examination by Occupational Safety and Health Competency Examination Body
Occupational Health Nurse (OHN)	Authorised Entrant and Standby Person for Confined Space (AESP), AESP-Refresher
Certified Medical Impairment Assessor (CMIA)	Authorised Gas Tester and Entry Supervisor for Confined Space (AGTES), AGTES-Refresher
Basic Occupational First Aid (BOFA)	Site Safety Supervisor (SSS)
Working Safely at Height (WAH)	Safety and Health Officer (SHO)
Scaffolder (BSC)	Hygiene technician 1 (HT1)
High Pressure Water Jetting (HPWJ)	Hygiene Technician 2 (HT2)
OSH Train the Trainer Competency Based Program (TTT1)	Chemical Health Risk Assessment (CHRA)
Safe Handling of Forklift Truck (SHFT)	Crane Operator (Crane)
Construction Safety and Health Trainers (CSHT)	Indoor Air Quality Assessor (IAQ)
Inert Space Entry Training (IET)	Noise Risk Assessor (NRA)
Confined Space Trainer (CST)	Occupational Health Doctor (OHD)
Confined Space Rescue (CSR)	
Construction Work Permit for Receiving Authorized Authority (CWP-RAA)	
Ergonomic Trained Person for Initial Ergonomics Risk Assessment (ERA1)	
Ergonomic Trained Person for Advanced Ergonomics Risk Assessment (ERA2)	

(Sources: National Institute of Occupational Safety and Health, Malaysia (2023)
(Available online at <http://www.niosh.com.my/training>) (Access May 2023)

However, the safety training for foreign construction workers is not mandatory and there is no measurement has been established to enable the industry players to gauge their current state of safety culture in construction sites even though the amendment OSHA 1994 has been revised recently by adding the new sections related to training and education under the duty of principal, and occupational safety and health training course.

6.3 Construction Safety Training in Japanese Construction Industry

In Japan, the employers are obligated to provide safety and health education related to construction to all workers including new workers and foreign workers stated in the Article 59 of Industrial Safety and Health Act (1972). Safety and health education must be conducted by the construction companies when engaging workers and it is mandatory

to provide said education without delay when there are changes of workers in the construction sites. The safety training for all the contractor's personnel provided by the contractors must be designed in a language which the persons to be trained fully understand as appropriate (clause 1.19 in Japan International Cooperation Agency Standard Safety Specification) (JICA, 2021). Besides, the Ordinance on Industrial Safety and Health stated the education must be included i) how to handle hazard harmfulness of materials or machinery, and etc., ii) handling methods for safety devices, harmful substance control devices or personal protective equipment, iii) operation procedures, iv) inspection at the commencement of work, v) causes and prevention of illness related to the work, vi) housekeeping and maintenance of cleanliness, vii) emergency measures and evacuation in case of accident and viii) In addition to the items listed in the preceding items, matters necessary for maintaining safety and health related to the work. In addition, the contractors are to set out the basic principles of voluntary safety management activities while taking into account the provisions in the tender documents, the contract documents and the requirements such as morning meeting on safety, foreseeing hazardous activities, tool box meetings, safety rota systems, regular, monthly and periodic inspections, sorting, decluttering and cleaning, safety conventions, safety patrol near-miss reporting system and others stated Clause 3.7 in the Guidance for the Management of Safety for Construction Works in Japanese Official Development Assistance Projects (JICA, 2014) to enhance the safety and health performance in construction sites. However, most of the developing countries that export manpower to other countries do not implement such mandatory safety training for workers, especially the foreign workers that may lead to a high rate of construction accidents. Therefore, it is necessary to carry out effective construction safety training and education to improve workers' ability in risk recognition (Cheng and Wu, 2013).

With the involvement of heterogeneous workforce in the construction industry, in particular, language barriers and differences in customs regarding construction site safety are significant challenges. Many studies concluded that safety training is the effective method to educate and regulate the workers' behaviours and characteristics towards safety issues (Jaafar et al., 2017; Casey et al., 2021). However, there is a dearth of insight of the different nationalities' workers' safety performance after the verbalised materials

of safety training. There are limited studies focusing on the types of safety training materials used in construction for workers with different characteristics and approaches, and how effectiveness of the safety training materials can be applied to different nationalities. Therefore, the purpose of this study is to clarify the differences in Japanese safety practices and to identify the characteristics of verbal and non-verbal safety teaching materials experienced by the construction novices and foreign workers in Japan and Malaysia.

Research questions were formed to reflect the aim of the study:

Is there any difference in the approach toward construction safety between Japanese and non-Japanese inexperienced personnel in Japan?

Is there any difference between Japanese and Malaysian approaches towards construction safety?

Is there any difference in perception between verbal and non-verbal materials?

In order to identify the research questions, this chapter aims to clarify the differences in Japanese safety practices and to identify the characteristics of non-verbal safety teaching materials experienced by the construction novices and foreign workers in Japan and Malaysia. By comparing the differences in attitudes of construction novices and workers who experience the verbal and non-verbal safety materials, to identify which materials can be worked effectively regardless of the nationalities. Three objectives were formed to achieve the aim: 1) to determine the differences in attitudes of inexperienced personnel between Japanese and foreign workers, 2) to investigate the attitudes among different nationalities in non-verbal materials and 3) to find out the differences between verbal and non-verbal materials in construction safety training contents.

6.4 Construction Safety Training

Safety training is a widely used intervention for preventing occupational injuries at work. Studies have shown that safety training is the effective method to educate and change the worker's behaviours towards construction safety issues to reduce the construction accidents (Li et al., 2012; Jeschke et al., 2017; Jaafar et al., 2017; Winge et al., 2019;

Casey et al., 2021; Vignoli et al., 2021; Wang et al., 2021) especially before and during the construction phases (Esmaeili and Hallowell, 2012).

The key element of safety training was to improve the communication skills via verbal, non-verbal and cross-cultural to establish the effective safety training among the workers (Jeschke et al., 2017). Safety training is often mandated by regulators and contractors, which might limit the sense of choice for the construction workers (Casey et al., 2021). With the involvement of heterogeneous workforce in the construction industry, in particular, the language barriers experienced by foreign workers, low education level (Arif et al., 2021) and differences in customs (Baseline Survey Construction Report, 2015) regarding construction site safety are significant challenges with learning in safety training.

Besides, on a multilingual and multicultural construction site, the workers are unable to rely on a shared verbal language especially during the safety training (Oswald et al., 2019). Differences in customs cause workers on the same construction sites speak different languages, which can lead to different understanding of the safety training that the workers must attend, and the foreign workers often work with people from the same cultural background which hinders the learning of the safety norms, regulations and language of the host country (Al-Bayati et al., 2017). Many foreign workers employed in the construction industry have problems in understanding safe work procedures and instructions due to language issues (Dai and Goodrum, 2011; Cheng and Wu, 2013; Deminirkesen and Arditi, 2015; Ismail et al., 2018). Therefore, how to effectively provide workers from multinationals with consistent safety knowledge and training has become a challenge.

6.5 Safety Training Contents to Address the High Frequency of High-risk Activities on Sites

The high frequency of construction accident types namely falls from height, struck, crushed and hit by were identified and investigated by the authorities (Fatal Accident Case, DOSH, 2020; OSH Statistic in Japan, JISHA, 2020) and researchers (Swuste et al.,

2012; Hoła and Szóstak, 2015; Nadhim et al., 2016; Evanoff et al., 2016; Umer et al., 2018; Abukhashabah et al., 2020). Studies focusing on construction mortality data concluded that most frequent accidents were falling from height; struck, crushed or hit by falling objects or vehicles and falling from a moving platform (Swuste et al., 2012). In Japan, most of the fatal accidents occurred at the temporary and building structures, other devices or open edges without the fall-prevention system in high-rise building projects (Manzoor et al., 2021). The accidents related to heavy machinery operation such as lifting and slinging are common in construction sites. To ensure the qualities of construction machinery, inspection and maintenance are significant. In developing countries, many operators are rarely aware or not know about the inspection of machinery or maintenance of machinery. It is customary for the operators to carry out repair or maintenance after a machine has broken down due to the delay in developing law concerning inspection of construction machinery. Besides, insufficient technique among the operators at site is found, despite the system of skill training and qualification of operators being developed to a certain extent in the standards.

The factors causing fall from height at construction sites included working environment condition, organisational characteristics, workers' safety behaviours (Hu et al., 2011; Nadhim et al., 2016), supervision, education and training (Khosravi et al., 2014). Most of the construction fatal accidents were due to lack of Personal Protective Equipment (PPE), lack of supervision and training and lack of non-compliance work safe procedures (Bakar et al., 2008; Ayob et al., 2018; Ammad et al., 2021). However, the occurrence of construction accidents is considered as unsafe working conditions and behaviours which can be prevented by implementing safety and health guidelines strictly (Srinavin, 2007). Safety training is able to cultivate the safety culture and improve safety motivation among the workers in high-risk industries (Hutchinson et al., 2022). Therefore, the safety training contents should be aimed at the current issues in order to effectively alleviate the construction accidents. The contents focus on the fall protection, PPE, use of tools and materials handling and lifting are generally covered in both large and small construction firms (Cunningham et al., 2018) in developed countries. Yet, the above accidents remain as the critical construction accidents in many countries. In particular, falls from height is the highest frequency and highest fatality rate among the other types of accidents on

construction sites due to unsafe behaviours, not compliance to work safe procedures, improper use of Personal Protective Equipment (PPE) among the workers (Nadhim et al., 2016; Muhamad Zaini et al., 2020). Therefore, the need for an effective approach in providing safety training to construction novices is necessary.

6.6 Safety Training Methods to Address the High Frequency of High-risk Activities on Sites

Safety Training Methods

Various safety training methods introduced in shaping construction worker's safety behaviours including traditional and contemporary have been implemented in the construction sites world widely. Researchers have used empirical methods to evaluate the effectiveness of the e-learning methods (Ho and Dzeng, 2010) with the involvement of computer-aided technologies (Teizer et al., 2013; Li et al., 2018; Ahn et al., 2020; Nykänen et al., 2020; Zujovic et al., 2021) in developed countries that used to reduce the construction accidents. Conventional approaches and the standard Occupational Safety and Health regulations (Buranatrevedh, 2015) were implemented in most of the countries as construction companies' restraint safety budget for high-tech safety training (Mohammadi et al., 2018). Many developed countries such as the United States, Korea and China, are developing the use of computer software, including virtual reality technology, to facilitate learning by providing virtual environments to enhance the learning performance (Albert et al., 2014b; Hou et al., 2017; Zhang et al., 2020; Zhu et al., 2022). However, training with low engagement among workers is common in the construction industry (Cunningham et al., 2018).

Traditional Safety Training Methods

The traditional safety training methods is also known as low engagement method including classroom lecture (Başaga et al., 2018), toolbox training (Jeschke et al., 2017), and audio-visual materials (Blanchard and Simmering, 2014) able to provide better

explained on the hazards to reduce the accident rate by improved the workers' knowledge acquisition and behaviour alteration (Gao et al., 2019). Proper safety training with lectures able to improve the fall safety knowledge, risk perceptions, comprehensive safety and safety culture on worksite by the workers (Forst et al., 2013; Evanoff et al., 2016). Traditional safety training attracts the learners by the use of listening, visual and reading, and the learning outcomes are based on individuals, varies. Traditional safety training attracts the learners by the use of listening, visual and reading, and the learning outcomes are based on individuals, varies. Learners are involved in a passive method with the given instruction and information, therefore, proper safety training suits to construction sites cultures is necessary to conduct for the construction workers regularly to enhance the safety knowledge.

Traditional safety training methods are popular to the construction companies due to resource constraints since it is sufficient to enhance the basic safety knowledge among the workers effectively with statistical evidence (Gao et al., 2019). The visual aids are able to sustain the workers' interests and attention to solve the language problems during the training sessions (Demirkesen and Arditi, 2015; Guo et al., 2012; Guo et al., 2017). The non-verbalized content, such as videos with related safety contents as part of the safety training methods used in construction industry resulted in better knowledge transfer, especially when the video-based learning with a conclusion and slight humour able to provide better understanding and clarity to teach the non-native speaking workers (Arif et al., 2021). Therefore, such traditional methods are still widely implemented in many countries.

Some researchers considered the traditional safety training is not an ideal solution for construction workers (Guo et al., 2017) when compared with more intensive forms of instruction (Burke et al., 2011), yet, these approaches were implemented in most of the countries as construction companies' restraint safety budget for high-tech safety training (Mohammadi et al., 2018), since it is sufficient to enhance the basic safety knowledge among the workers effectively with statistical evidence (Gao et al., 2019).

Researchers claimed that the safety training should progress by stage of first using rationalistic and less engaging methods to transfer declarative safety knowledge (Brahm

and Singer, 2013). Early safety training with the use of images with texts and video lectures with oral presentation are crucial as part of the safety culture creation to protect workers from construction accidents (Başaga et al., 2018).

The Business Legal Report (BLR) (2014) report suggests using more visual aids in safety training sessions could provide benefits of being self-paced. Learners are involved in a passive method with the given instruction and information, therefore, proper safety training suits to construction sites cultures is necessary to conduct for the construction workers regularly to enhance the safety knowledge. Many types of safety training involving visual-aid approaches have been introduced to promote the construction safety issues (Li et al., 2018b; Ahn et al., 2020; Nykänen et al., 2020; Zujovic et al., 2021). Previous study revealed that the less information-dense and visualised training materials such as videos with graphics performed the best at stimulating learning across age groups (Wallen and Mulloy, 2006). The use of the non-verbalized materials such as short clips or videos with or without the aid of audio, to provide better knowledge transfer among the construction novices has potential to overcome such issues among the construction novices (Zujovic et al., 2021). Besides the use of videos for safety and health communication to field-based workers was proven to be well received by workers (Edirisinghe and Lingard, 2016). Since the low engagement method is common in the construction industry, it can be claimed that this method enables the trainer to present the basic safety knowledge in a relatively brief amount of time to the novices to form a better foundation of learning (Pui Teck and Mohd Asmoni, 2015).

Despite the variety of safety training contents and methods now available in the industry, the accidents on construction sites have not been effectively mitigated. Researchers found out that younger workers are likely to be concerned about safety and willing to learn although they own less safety knowledge than experienced workers (Shuang et al., 2019). To the author's knowledge, there is less research on safety training focused on construction novice. As more young workers of different nationalities join the construction sites and face challenges such as lack of experience, language barriers and cultural differences, the use of non-verbalized based safety training may be effective in raising safety awareness among construction workers.

Undeniable, the effective transfers of safety training and knowledge are based on the workers' preferences such as ages, education background and culture (Baseline Survey Construction Report, 2015), where lack of uniform language (Dai and Goodrum, 2011) cause poor communication (Ismail et al., 2018) and low education level (Arif et al., 2021) are the barriers in safety education which become more problematic as multi-ethnicity involve in construction site. There is still argument on the effectiveness of the safety training implemented in construction sites due the low safety awareness and culture of the construction workers who came from developing countries; and the attitudes towards the safety training programs are unclear.

6.7 Experimental Design

From the previous research above, what we can understand is that language, culture, and tools go hand in hand to effectively implement safety education. In particular, we are interested in whether useful safety education content developed in one country would be useful in another country. The study conducted a comparative experiment of both safety training materials between the students and foreign workers with different nationalities in Japan and Malaysia. Two major dimensions were defined to compare the training effectiveness between verbal and non-verbal training namely safety knowledge, baseline measurement and evaluation of attitudes towards circumstances. The safety knowledge baseline measurement was measured through the score points obtained from the respondents; while the evaluation of attitudes was measured through the traditional scale measurement. *Population:* A total number of 291 participants including 65 Malaysian undergraduates (taking courses in Construction Management), 71 Japanese undergraduates (taking courses in Project Management for Building Construction), 68 Japanese postgraduates (Architecture and Architectural Engineering course), 27 foreign workers (Indonesians) in Malaysia and 60 foreign technical trainees (Vietnamese) in Japan. The selected undergraduates possessed similar degrees in the same field that generated a similar crowd, and received construction safety related lectures respectively in their universities. Therefore, the comparability is reasonable. The selected construction

foreign technical trainees in Japan with less than three years of working experiences; and foreign workers in Malaysia with at least 5 years of working experiences in the construction industry. All the construction companies will be anonymous due to privacy and confidentiality. The participants were categorised into two main groups to receive the same training contents prepared in different materials (Table 6.4). The participants received ten safety training contents categorised into three sections (Table 6.5). Sub-group A receives verbalised material (photos and texts); Sub-group B receives the non-verbalized materials (no subtitle provided) for each section. The participants were requested to respond to a set of test questions via *Google* form after receiving the training materials through an online platform. The foreign workers in Malaysia only available in non-verbalized materials due to low literacy level, therefore, the test for this group was conducted by reading the questions to receive response from all the workers. Figure 6.1 indicated the process of the experiment. The entire experiment process takes about an hour for each sub-group.

Table 6.4: Description of sample data

Verbal group		Japanese (JP)	Malaysian (MY)	<i>N</i>	%
A ₁	BSc students	36	33	69	51
A ₂	Postgraduates	35	-	35	26
A ₃	Foreign Workers	30	-	30	22
total		101	33	134	100
Non-verbal group					
B ₁	BSc students	35	32	67	43
B ₂	Postgraduates	33	-	33	21
B ₃	Foreign Workers	30	27	57	36
total		98	59	157	100

Table 6.5. Safety training contents

Safety training contents	Section	
Way to wear PPE	1	Personal Protective Equipment (PPE)
Way to wear safety helmet		
Wearing method of moon belt type of safety belt		
Wearing of full harness type of safety belt		
Way to use pipe cutter	2	Work at height and correct way to use tools
Way to use cutting tools		
Work at height (portable workbench)		
Up and down work	3	Lifting operation and site cleanliness
Housekeeping on site		
Lifting operation on site (sling)		

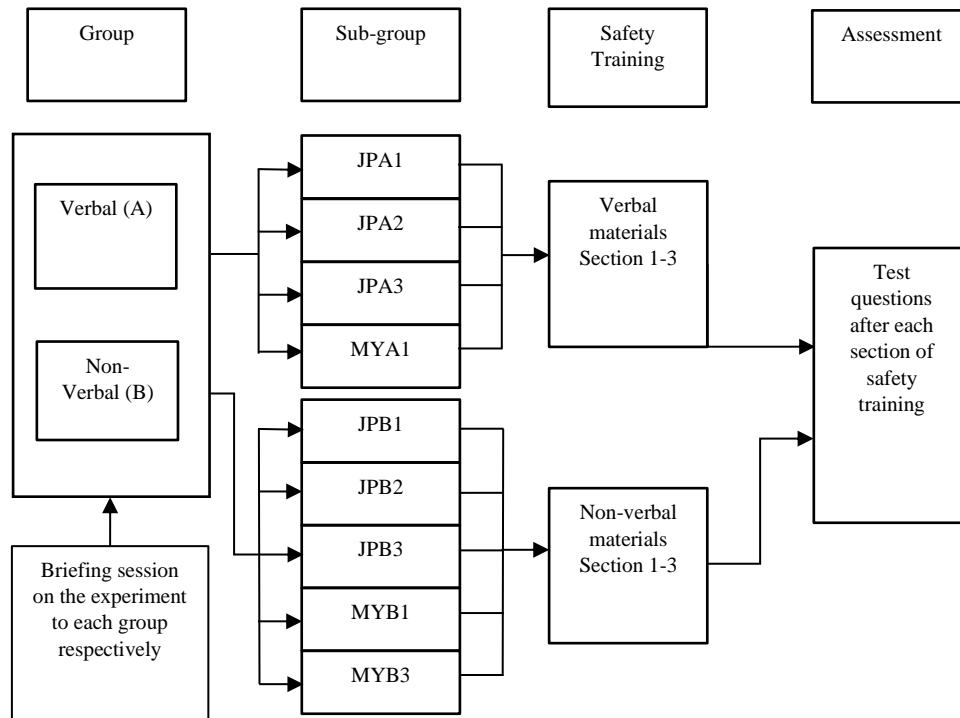


Figure 6.1: Process of the safety training and assessments by groups

Rationale of the Selected Safety Training Materials

The safety contents used in the study was originally sourced from *Planex*, a Japanese video production company specialising in safety and health awareness materials aimed to

reduce the number of workers affected by disasters and accidents that can be used as a reference. Interestingly, the non-verbal safety training content video (with no narration or subtitles) was innovatively produced to adopt the Japanese construction site culture that can be used as a general safety education material for the construction industry. There were ten (10) safety contents including “Proper attire to wear on a construction site”, “Proper method to wear safety belt”, “Proper method to wear full body harness safety belt”, “Proper method to use portable tools”, “Proper way to keep site clean (Housekeeping)”, “Proper way to handle materials during sling operation”, “Proper way to work on portable work platform”, and “Proper way to work up and down work on-site”. These safety teaching contents represent 10 different cases on the real scenarios on-sites to indicate the correct and wrong ways of conducting the tasks on-sites. One of the interesting points is that the non-verbal safety education materials demonstrate the consequences (here refers to serious injuries) caused by improper or incorrect methods of working behaviours, so that the receivers can acquire a deeper impression after the training. The eighteen minutes’ length of non-verbalized video contents were used in this experiment to determine whether there is any difference in the impressions between Japanese and Malaysian construction novices and workers regardless of nationality. The comparative experiment aimed to examine whether people of different nationalities, ages and work experience can use non-verbal safety education to acquire safety knowledge and apply it effectively in real work environments. The selected training contents in Table 2 were based on the common accident types and causes reported in DOSH and JISHA as a guide. These topics are related to the unsafe working behaviour, unsafe working procedure, and unsafe site condition that mentioned earlier in the studies by Liu and Tsai (2012).

Construction Safety-related Test Questions

A total of 60 questions were designed and prepared in multi-languages settings namely English, Japanese, *Bahasa* Malaysia and Vietnamese to suit all the respondents to eliminate the language issue. The questions equally set for three sections, each sections solicits two sub-sections namely general knowledge (5 questions) in multiple choices questions to check the baseline of the measurement; and the rationale to select the 7-

points Likert-scale measurement (1 = Strongly Disagree, 7 = Strongly Agree) for the scenario questions (15 questions) to check the impact of content on impression ratings from the participants. The data were analysed by nonparametric tests, Mann-Whitney *U* Test as it is more suitable for skewed distributions or data with discrete or ordinal scale (Krzywinski and Altman, 2014).

6.8 Discussion and Findings

The data was analysed whether or not there is any significant differences in the mean scores between the groups by both training materials. The general knowledge questions were compulsory to examine differences in initial understanding towards safety training among all the respondents to accurately measure the outcomes of the experiment. The results showed no significant differences in the overall safety knowledge among most of the groups in verbal and non-verbal materials, except for Japanese undergraduates of both materials for 2 sections, however, the score points obtained from this group in both materials were the second after Japanese postgraduates. In terms of scored points, the non-verbal material tends to work better for undergraduates; while verbal material tends to work better for inexperienced personnel between Japanese and non-Japanese in Japan. The statistical analysis provides detailed information of each group for three sections as shown in Table 6.6.

Table 6.6: Test scores for general knowledge among all groups

	Questions	JPA1	JPB1	JPA2	JPB2	JPA3	JPB3	MYA1	MYB1	MYB3
Code	Section 1: Personal Protective Equipment									
S1-1	Which is the safest way to wear a helmet?	86	89	89	88	90	83	88	91	93
S1-2	Which is the safest material for work gloves?	56	74	77	70	53	63	33	50	74
S1-3	Which of the following is the most appropriate footwear for use during construction?	100	100	100	100	100	100	100	100	100
S1-4	What is the most inappropriate clothing to wear while working?	92	91	97	94	97	87	88	94	82
S1-5	When is it not necessary to wear a safety helmet on site?	97	100	100	100	100	93	100	97	82
	Average score points (x 5)	4.31	4.54	4.63	4.52	4.43	4.27	4.09	4.31	4.3
	Mann-Whitney U Test (p-value<0.05)	NS		NS		NS		NS		n.a.
	Section 2: Work at Height									
S2-1	Which of the following is the most inappropriate precaution to take when working on and under scaffolding?	69	86	60	79	57	60	55	56	67
S2-2	Which of the following is the most inappropriate action to take when you notice that a scaffold member has come loose	64	77	66	64	67	80	58	63	82
S2-3	Which is the most appropriate procedure for unloading a load after working on a workbench?	97	100	97	97	90	77	70	78	74
S2-4	Which of the following is the most inappropriate when working on scaffolding?	94	100	97	91	83	90	73	84	63
S2-5	What is the most appropriate height for the hook of the safety belt?	3	0	0	0	83	67	3	3	93
	Average score points (x 5)	3.28	3.63	3.26	3.30	3.03	3.33	2.58	2.84	3.78
	Mann-Whitney U Test (p-value<0.05)	*		NS		NS		NS		n.a.
	Section 3: Lifting Operation and Site Cleanliness									
S3-1	Which is the most inappropriate behaviour in lifting operations?	75	91	89	100	70	70	82	72	85
S3-2	Which of the following is the most inappropriate way to give instructions to a crane operator?	83	97	94	91	100	97	97	97	82
S3-3	Which of the following is the most inappropriate reason for keeping the work area clean?	92	100	91	79	90	93	91	94	93
S3-4	Who is responsible for keeping the work area tidy?	97	100	100	97	100	97	97	94	100
S3-5	Which of the following is most inappropriate in relation to safety passages on site?	97	100	100	100	93	90	61	63	59
	Average score points (x 5)	4.44	4.89	4.74	4.67	4.53	4.47	4.27	4.19	4.00
	Mann-Whitney U Test (p-value<0.05)	*		NS		NS		NS		n.a.

Result indicators, NS = No significance, * represent p value<0.05, *** represent p value<0.001, n.a.=not applicable

Personal Protective Equipment (PPE)

Majority of the respondents answered all questions correctly in PPE section except question S1-2; precisely, about half of the undergraduates from the verbal group answered wrongly for the safer materials for work gloves as they do not experience hands-on activities such as cutting board on site; therefore, this might be the reason why the answers were varied.

Work at Height

Most of the students scored less satisfied for the section of “work at height”, especially to the question “*What is the most appropriate height for the hook of the safety belt?*”, 74% from verbal groups, 80% from non-verbal groups answered “*height between waist and*

chest”, where the correct answer is “*as high as possible*”. However, the test scores obtained from the construction workers were slightly higher as they own related experiences on site. Nevertheless, all the respondents who underwent non-verbalized materials scored higher than verbalised materials in this section.

Lifting Operation and Site Cleanliness

The average scoring points for “lifting operation and site cleanliness” were generally higher than the other sections, especially Japanese undergraduates scored 4.89 under non-verbal group; yet, Japanese postgraduates and technical trainees scored slightly higher for verbalised than non-verbalized materials. Only 60% of the Malaysian undergraduates and foreign workers answered correctly for the question S3-5 (Table 3) where this might be due to the Malaysian undergraduates not having such experiences and the foreign construction workers not performing such practices in Malaysian construction sites.

Summary of General Knowledge after Both Training Materials

The results indicated no significant differences in inexperienced personnel between Japanese and non-Japanese in both training materials, yet, the postgraduates scored higher points than foreign trainees in both training materials which might be due to different education background and safety culture. The scored points from Japanese undergraduates, postgraduates and technical trainees were similar and it indicates that they own a standardised level of understanding toward the safety knowledge compared to Malaysian undergraduates who performed less satisfied in both training materials. Statistically significant differences between Japanese and Malaysian undergraduates for 2 sections in non-verbalized materials (work at height, $p < 0.05$; lifting operation and site cleanliness, $p < 0.001$), but the scored points of all sections in non-verbal materials are higher than verbal materials for both undergraduates’ groups. The foreign workers in Malaysia performed moderately in the non-verbal material among all the groups as they have their own field experiences which is slightly different from Japanese. The next session will further discuss the attitudes towards scenario questions by groups, to find out the research questions stated in the earlier.

Attitudes towards Construction Sites Situational Questions

General

The scenario questions were designed according to the real situations to determine the respondents' attitudes towards different scenarios on site. Most of the scenario questions were not reflected directly during the training sessions, therefore the attitudes on how the respondents will react and respond to the situations in construction sites can be tackled through the Likert-scale measurement. The obtained data were undergone Mann-Whitney *U* test to determine the significance differences of mean scores between verbalised and non-verbalized materials between each group. As the nonparametric statistical analysis, Mann-Whitney *U* test ranks all the values ascending with a *p*-value to measure the discrepancy between mean ranks between two study groups (GraphPad, 2022). The smaller the *p*-value would suggest a more significant difference between the two experimental groups. The discussion will base on the questions with the smallest *p*-value ($p < 0.001$) as statistically highly significant differences.

6.9 Comparative Experiment on Teaching Methods: Foreign Worker

Comparative analysis

The general results indicated the differences mean scores of both training materials in three ways namely: inexperienced personnel between Japanese and non-Japanese in Japan (JPA2-JPA3 and JPB2-JPB3); the differences of non-verbalized material between nationalities (JPB1-MYB1 and JPB3-MYB3) and differences between verbal and non-verbal materials among the groups (JPA1-JPB1, JPA2-JPB2, JPA3-JPB3 and MYA1-MYB1) to reflect the research objectives (Table 6.7). The discussion will be based on the significant differences among the questions per section by groups.

Table 6.7: Differences between verbalised and non-verbalized materials by groups

Comparative Analysis		1		2		3			
		JPA2-A3	JPB2-B3	JPB1-MYB1	JPB3-MYB3	JPA1-B1	JPA2-B2	JPA3-B3	MYA1-B1
Code	<i>Section 1: PPE</i>								
S1-6	Safety helmets are useless in case of a fall	NS	*	NS	NS	NS	NS	NS	NS
S1-7	It is safer to wear a helmet with a towel wrapped around your head.	NS	*	NS	*	NS	*	NS	NS
S1-8	Helmet chinstrap should be left loose.	NS	NS	NS	NS	NS	NS	NS	NS
S1-9	No more crashes from scaffolding simply by wearing a safety belt.	NS	NS	**	NS	NS	NS	NS	NS
S1-10	It is safer to wear cotton gloves when cutting the materials.	*	NS	NS	NS	*	NS	NS	NS
S1-11	Only carelessness can cause injuries when cutting boards with cutters.	**	NS	**	*	NS	*	NS	NS
S1-12	You may wear sandals when working, as long as you are not working on the scaffold.	NS	NS	NS	NS	NS	NS	NS	NS
S1-13	It is alright to wear short trousers when working on the interior.	*	NS	*	**	*	NS	NS	NS
S1-14	The height at which the safety belt hooks should be attached as low as possible.	NS	NS	*	*	*	NS	NS	NS
S1-15	Full harness fastenings are safer when attached to the chest.	NS	NS	NS	**	NS	NS	NS	NS
S1-16	When cutting pipes, it is safe to do so without the use of special tools.	NS	NS	NS	**	NS	*	NS	NS
S1-17	No matter how hot it is, you should wear long sleeves on construction sites.	NS	NS	NS	NS	NS	NS	NS	NS
S1-18	If you sweat a lot, it is good to work with a towel around your necks.	NS	NS	*	**	NS	*	NS	NS
S1-19	Wearing socks can help to prevent injury.	NS	*	*	**	NS	NS	NS	NS
S1-20	Never work with the chin strap of the helmet unfastened.	NS	NS	NS	*	NS	NS	NS	NS
	<i>Section 2: Work at Height</i>								
S2-6	You may start work even if there is a worker under you on the scaffold.	NS	NS	NS	NS	NS	NS	NS	NS
S2-7	It is safe to move the workbench without folding it.	*	*	NS	**	*	NS	NS	NS
S2-8	There is a risk of falling if you step off the workbench while carrying a load in one hand.	NS	NS	*	*	NS	NS	NS	NS
S2-9	It is safe to work on the scaffold without hooking the safety belt.	*	NS	NS	**	NS	NS	NS	NS
S2-10	The hook of the safety belt should be hooked at a height below the waist.	NS	NS	*	*	*	NS	*	NS
S2-11	It is dangerous to work on the edge of the workbench.	NS	NS	NS	NS	NS	NS	NS	NS
S2-12	In scaffold assembly work, it is not necessary to hook up safety belts if you are only moving on the scaffold.	NS	NS	NS	**	NS	NS	NS	NS
S2-13	Cutters need to be used on a stable platform.	NS	NS	*	*	NS	NS	NS	NS
S2-14	You should not wear a leather glove when cutting boards with a cutter.	NS	NS	**	NS	*	NS	NS	NS
S2-15	It is dangerous to use power tools while carrying out other tasks.	NS	NS	*	NS	NS	*	NS	NS
S2-16	I hooked my safety belt on the same rope as the worker next to me.	**	*	NS	NS	NS	NS	*	NS
S2-17	It is better to use a full harness safety belt when working at height.	NS	NS	NS	NS	NS	NS	*	NS
S2-18	The use of specialist tools can help to prevent injury.	**	**	**	NS	NS	NS	NS	NS
S2-19	The end of the workbench must be fitted with a stopper to prevent falling from height.	*	NS	NS	*	NS	NS	NS	NS
S2-20	If it is low enough, even a small crash can kill you.	NS	NS	*	*	NS	NS	NS	NS
	<i>Section 3: Lifting Operation and Site Cleanliness</i>								
S3-6	Tidiness on the construction site helps to prevent accidents.	NS	NS	NS	*	NS	NS	NS	NS
S3-7	After using machines and tools, the user is responsible for cleaning up.	NS	NS	NS	NS	NS	NS	NS	NS
S3-8	It is a waste of time to clean your work area afterwards.	NS	NS	NS	**	NS	NS	NS	NS
S3-9	It is best to stay as close to the load as possible when lifting.	NS	NS	NS	*	NS	NS	NS	NS
S3-10	Lifting operations should be carried out by experienced workers if possible.	NS	*	NS	NS	NS	NS	NS	NS
S3-11	It is safe to work near the construction machinery.	*	NS	NS	*	NS	NS	NS	NS
S3-12	Work can be done more efficiently when the work area is tidy and organised.	*	NS	NS	NS	NS	*	NS	NS
S3-13	Materials and tools are stored in an organised way and it can be searched efficiently.	NS	NS	NS	NS	NS	*	NS	NS
S3-14	If the work area is dirty, it is easy to trip over it when working.	*	NS	NS	NS	NS	*	NS	NS
S3-15	Materials stored in the safety corridor can lead to injury.	NS	NS	**	*	NS	NS	NS	NS
S3-16	The area around the construction machinery at work should be off-limits.	NS	*	NS	NS	NS	NS	NS	NS
S3-17	The wire rope should be checked for damage before lifting operations are carried out.	NS	NS	NS	NS	NS	*	NS	NS
S3-18	Even if you have to work in the same place tomorrow, you should clean your work area afterwards.	NS	NS	NS	**	NS	NS	NS	NS
S3-19	When unloading with a crane, it is better to stay close to the load.	NS	NS	NS	NS	NS	NS	NS	NS
S3-20	When unloading with a crane, it is not dangerous to hold the crane by hand when it shakes if it is in a low position.	NS	NS	NS	NS	NS	NS	NS	NS

Results indicator, *p-value <0.05, ** p-value <0.001, NS=no significance

Differences of Attitudes between Japanese and foreigner by inexperienced personnel in Japan for verbal and non-verbal safety training materials

There are significant differences in three questions from two sections (PPE and correct way to use tools) for verbal materials and only one question with significant differences in non-verbal materials among the two experimental groups due to differ opinions by the inexperienced personnel in Japan (Table 6.8).

Table 6.8: Differences of inexperienced persons in Japan for both training groups

Trainin g group	Verbal groups			Non-verbal groups		
	JPA2-A3 (N=65)			JPB2-B3 (N=63)		
	Mann-Whitney U test					
Code	Z value	<i>p</i> value	Code	Z value	<i>p</i> value	
S1-11	-4.166	0.000**	S2-18	-3.533	0.000**	
S2-16	-3.675	0.000**				
S2-18	-3.832	0.000**				

Notes: ** denoted *p* value lower than 0.001 representing a significant difference between the two groups

The differences of attitudes towards these questions were presented in the figures 2-5 below. For instance, almost all the Japanese postgraduates and about half of the technical trainees “strongly disagree” to “*Only carelessness can cause injuries when cutting boards with cutters*”; while 37% of technical trainees considered carelessness is the major concern to cause injuries (S1-11). Besides, 77% of Japanese postgraduates and all the technical trainees “strongly disagree” to “*I hooked my safety belt on the same rope as the worker next to me*” (S2-16). Furthermore, about 46% of Japanese postgraduates and 80% of technical trainees “strongly agree” to “*the use of special tools can help to prevent injury*” (S2-18) in verbal materials; 57% of Japanese postgraduates and 80% of technical trainees “strongly agree” to this scenario in non-verbal materials.

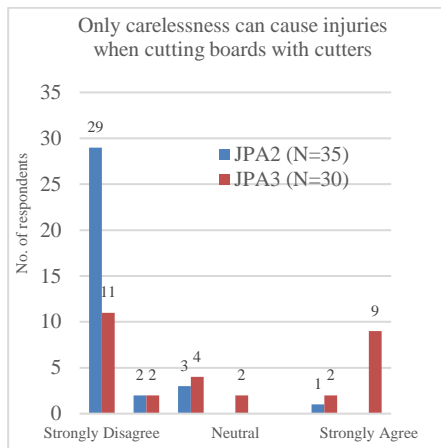


Figure 6.2

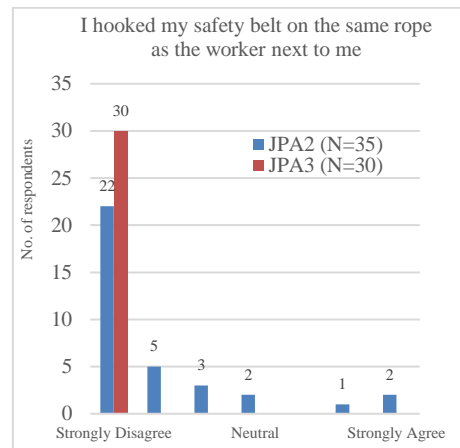


Figure 6.3

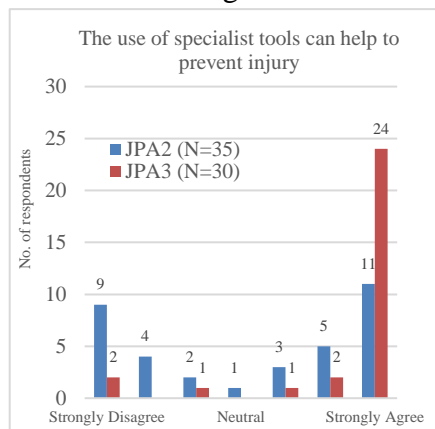


Figure 6.4

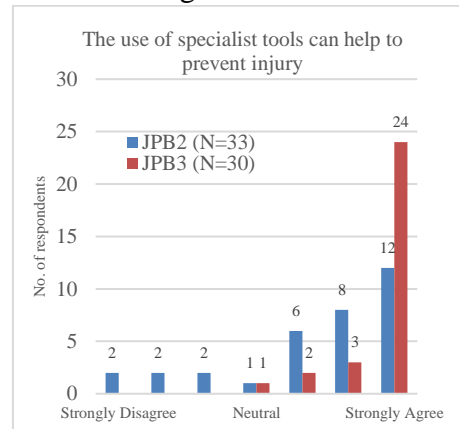


Figure 6.5

Figure 6.2-6.5: (left to right, top to bottom): Responses from the inexperienced personnel in verbal materials (Figure 6.2-6.4), and non-verbal materials (Figure 6.5)

Differences between nationalities in non-verbal material

There were significant differences found between Japanese and Malaysian undergraduates for five questions; and significant differences between foreign technical trainees and foreign workers in Japan and Malaysia for ten questions. Table 6.9 showed the scenario questions found significant differences between the groups under three sections. The attitudes towards the scenarios were slightly different among the experimental groups. The discussion begins with undergraduates then followed by foreign workers. These questions will be presented in figure 6.6 and 6.7 below to show the differences of attitudes by the respondents.

Table 6.9: Differences between nationalities in non-verbal materials

Non-verbal groups						
Training group	JPB1-MYB1 (N=67)			JPB3-MYB3 (N=57)		
	Mann-Whitney U test					
	Code	Z value	p value	Code	Z value	p value
	S1-9	-3.845	0.000**	S1-13	-3.912	0.000**
	S1-11	-4.221	0.000**	S1-15	-3.831	0.000**
	S2-14	-4.108	0.000**	S1-16	-3.703	0.000**
	S2-18	-4.183	0.000**	S1-18	-4.187	0.000**
	S3-15	-4.337	0.000**	S1-19	-3.508	0.000**
				S2-7	-3.91	0.000**
				S2-9	-4.69	0.000**
				S2-12	-6.173	0.000**
				S3-8	-6.304	0.000**
				S3-18	-4.47	0.000**

Notes: ** denoted p value lower than 0.001 representing a significant difference between the two groups

The attitudes by the undergraduates from Japan and Malaysia are somehow different towards the concept of unsafe actions on site. For instance, about 80% of the Japanese students and 41% of Malaysian students “strongly disagree” to “*No more crashes from scaffolding simply by wearing a safety belt*”; 6% of Japanese students and 38% of Malaysian students agreed to the statement (S1-9). About 83% of the Japanese students and 47% of Malaysian students disagreed that carelessness is the only cause of injuries when cutting boards with cutters, yet, 28% of Malaysian students agreed to this situation (S1-11). Furthermore, 94% of the Japanese students and 59% of Malaysian students “strongly disagree” to “*You should not wear a leather glove when cutting boards with a cutter*”; 25% of Malaysian students “strongly agree” to this situation (S2-14). About 43% of the Japanese students disagreed “*the use of special tools can help to prevent injury*”; while 40% of Japanese students and 97% of Malaysia students agreed to this situation (S2-18). Besides, All the Japanese students agreed that the materials stored in the safety corridor can lead to injury, while 63% of Malaysian students agreed to this situation (S3-15).

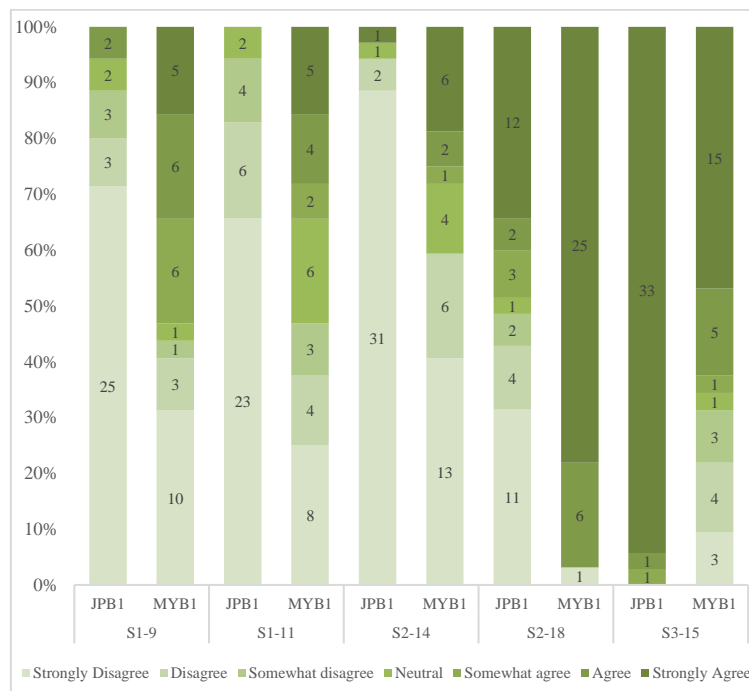


Figure 6.6: Responses from the undergraduates in Japan and Malaysia
(Questions from Section 1 to Section 3, left to right)

The findings discovered the different attitudes between the foreign workers who work in Malaysia and technical trainees who work in Japan. For instant, about 52% of foreign workers answered “strongly agree” to “*It is alright to wear short trousers when working on the interiors*” while only one technical trainee answered the same way; 89% of foreign workers and 27% of technical trainees answered “strongly agree” to “*If you sweat a lot, it is good to work with a towel around your neck*”. Under Section 2, foreign workers showed unsafe practices toward work at height where 67% and 89% of them answered “strongly agree” to “*It is safe to work on the scaffold without hooking the safety belt*” and “*In scaffolding assembly work, it is not necessary to hook up safety belts if you are only moving the scaffold*” respectively; while most of the technical trainees answered “strongly disagree” to both questions. Under Section 3, majority of the foreign workers’ responses “strongly agree” to “*It is a waste of time to clean your work area afterwards*” even have to work in the same place for tomorrow; while almost all the technical trainees answered oppositely.

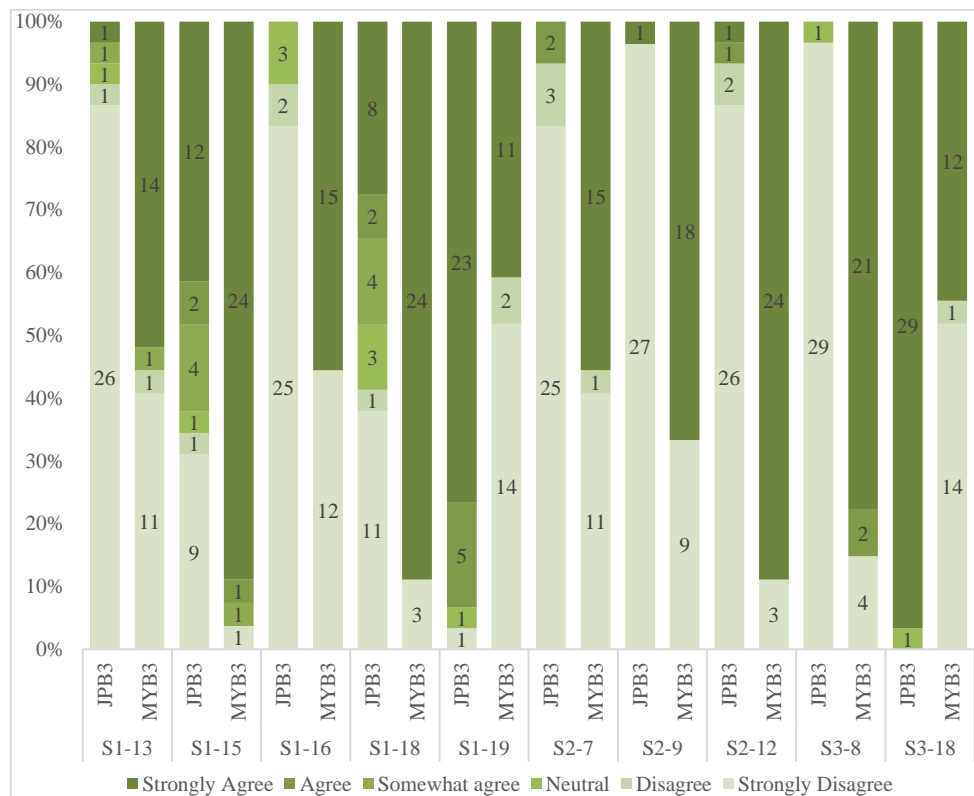


Figure 6.7: Responses from the foreign workers in Japan and Malaysia
(Questions from Section 1 to Section 3, left to right)

Differences between verbal and non-verbal materials by groups

The difference between Japanese undergraduates, postgraduates and foreign technical trainees in both training materials were found to have significant differences (p value < 0.05) in different scenario questions. Table 6.10 showed the differences between verbal and non-verbal materials among individual groups. Six questions were found significant differences under PPE, work at height and correct way to use tools among Japanese undergraduates; nine questions were found significant differences under three sections among Japanese postgraduates; and three questions were found significant differences under work at height among the foreign technical trainees. Malaysian undergraduates and foreign workers in Malaysia had no significantly different found in scenario questions for both training materials.

Table 6.10: Differences between verbal and non-verbal materials

Verbal and Non-verbal groups									
Training group	JPA1-B1 (N=71)			JPA2-B2 (N=68)			JPA3-B3 (N=60)		
	Mann-Whitney U test								
	Code	Z value	p value	Code	Z value	p value	Code	Z value	p value
	S1-10	-2.664	0.008	S1-7	-2.626	0.009	S2-10	-2.167	0.030
	S1-13	-2.016	0.044	S1-11	-2.778	0.005	S2-16	-2.051	0.040
	S1-14	-2.805	0.005	S1-16	-2.901	0.004	S2-17	-2.051	0.040
	S2-7	-2.073	0.038	S1-19	-2.487	0.013			
	S2-10	-2.858	0.004	S2-15	-2.327	0.02			
	S2-14	-2.536	0.011	S3-12	-2.107	0.035			
				S3-13	-2.107	0.035			
				S3-14	-2.095	0.036			
				S3-17	-2.107	0.035			

6.10 Summary of Discussions

The above discussions focused on the objectives to discover the: 1) Differences between Japanese and non-Japanese inexperienced personnel in Japan, 2) Differences between non-verbal materials among nationalities, and 3) Differences between verbal and non-verbal materials. Firstly, no significant differences can be identified between Japanese postgraduates and foreign technical trainees in Japan for either verbal or non-verbal materials, in particular, it can be assumed that there is no difference in non-verbal materials. The statistical analysis found no significant differences among most of the scenario's questions between the Japanese postgraduates and technical trainees in verbal and non-verbal materials, it can be specified that most of the inexperienced personnel own similar safety knowledge and attitudes toward the important of personal protective equipment, work at height, the correct way to use tools, lifting operation and site cleanliness in construction sites regardless the training materials. The first objective was achieved as no differences in perceptions of safety and health using non-verbal materials between inexperienced persons in Japan could be identified.

Secondly, statistical evidence was found in the non-verbal material showing a significant difference in attitudes towards the scenario questions between Japanese and Malaysian undergraduates; also, the foreign workers who work in Japan and Malaysia. Japanese students showed similar attitudes among themselves toward most of the scenario

questions; it can be claimed that they own standard safety knowledge towards unsafe actions within the safety training contents. In contrast, the Malaysian students tend to be ambivalent by frequent answers of “somewhat agree”, “somewhat disagree” and “neutral” in PPE and site cleanliness scenario questions where they might not have sufficient knowledge to recognize the unsafe actions on sites. Besides, the findings show a different safety culture between Japanese and Malaysian construction sites and different opinions among foreign workers. The foreign technical trainees are able to recognize the risks and know how to react correctly to avoid unsafe behaviour during working at site; while the foreign workers who work in Malaysian construction sites showed poor safety impressions as reflected from the scenario questions. All these unusual responses are reflecting the unsafe behaviour and poor working procedures in Malaysian construction sites, as the foreign workers in Malaysia have different perspective towards risk recognition and the potential behaviour react to the risks due to lack of safety training and low literacy level of education which is similar with the studies by (Cheng and Wu, 2013). Therefore, it can be confirmed that there are differences in the perception of safety and health in different countries, and this was more apparent to the experienced than the inexperienced.

Lastly, there were slightly differences between verbal and non-verbal materials in few questions among Japanese undergraduates, postgraduates and technical trainees, and no significant differences found among the Malaysian undergraduates and foreign workers in Malaysia as it can be interpreted as they have same level of understanding of both materials. Based on the findings, the Japanese undergraduates understood the non-verbal materials better, while the Japanese postgraduates understood the verbal material better; there were only three questions that identified differences among foreign technical trainees; it can be interpreted as insignificant differences for both training materials. Since the training materials used are produced in Japan, it can be assumed that the more safety and health knowledge Japanese people know about, the easier it will be to understand if it is presented clearly in language. For foreigners such as Malaysian undergraduates, foreign workers in Malaysia and Japan participated in this experiment, it can be interpreted that there is no significant difference between verbal and non-verbal materials.

Overall, respondents who received non-verbal materials had similar attitudes toward scenarios as the non-verbalized materials provided a level of visual danger, providing the same level of understanding regardless of whether the learner has field work experiences. Arguably, the verbalised materials do clearly convey what needs to be said, however the respondents can only understand within the scope of the explanation and may not understand the content well enough to apply that knowledge (Arif et al., 2021) especially those without field experiences. On the other hand, the non-verbal materials effectively improved unsafe actions among the undergraduates, while verbal materials worked well among inexperienced persons in Japan.

The majority of the safety training content is likely to be shared internationally, yet, some of the safety training contents may need to be customised due to the differences in national attitudes towards safety and health in their working environments. In the event of such customization, verbal materials are useful for native workforces while non-verbal materials will be useful for foreign workforces if there are language problems as there is no difference in understanding between verbal and non-verbal materials for foreign workers.

6.11 Comparative Experiment on Teaching Methods: Construction Novices

There were 136 undergraduates who participated in this experiment to capture the differences in understanding of safety knowledge after received different safety training methods among construction novices with different nationalities, 71 Japanese undergraduates (Project Management in Building Construction) and 65 Malaysian undergraduates (Construction Management) participated in this experiment, and their age range between 20-24. This study used convenience sampling, wherein all participants possessed similar degrees and received construction safety related lectures in their universities in the same field that generated a similar crowd. Convenience sampling is most often used during the exploratory phase of a research and it enables to obtain information quickly and efficiently (Sekaran, 2003). Besides, the sampling size larger

than 30 and less than 500 are appropriate for most research (Sekaran, 2003). A similar experiment was conducted by Shuang et al. (2019) to explore the relationship between age, genders and unsafe behaviours toward the accidents. However, the gender issue is beyond this experiment. Part of the research method used in Shuang et al. (2019) was to interview safety managers to gain insights into their perceptions of safety among workers from different ages and genders in the construction industry. Such a comparative approach provides insights rather than quantitative data. Quantitative approach provides a “snapshot” and a direct analysis of the experimental data (Fellows and Liu, 2022). In this study, a comparative experiment was used to compare the performance of two groups of novices (under the same age range) from different nationalities after receiving teaching methods. Therefore, a non-parametric test was used to examine the similarities and differences between the two groups using a rank sum test. Firstly, compare the average scored points between both safety training methods among the participants, next, the obtained results were undergone frequency statistical analysis among the groups to explain each question, under each section. The obtained data is not normally distributed (Figure 6.8) among the two groups, therefore, the Mann-Whitney U test, a non-parametric test to measure the discrepancy between the mean ranks among the two groups (Fellows and Liu, 2022). Mann-Whitney U test ranks all the values ascending with p-value, where the smaller the p-value (less than 0.05), the more significant the difference between the two groups. The details of the test are explained in the following sections.

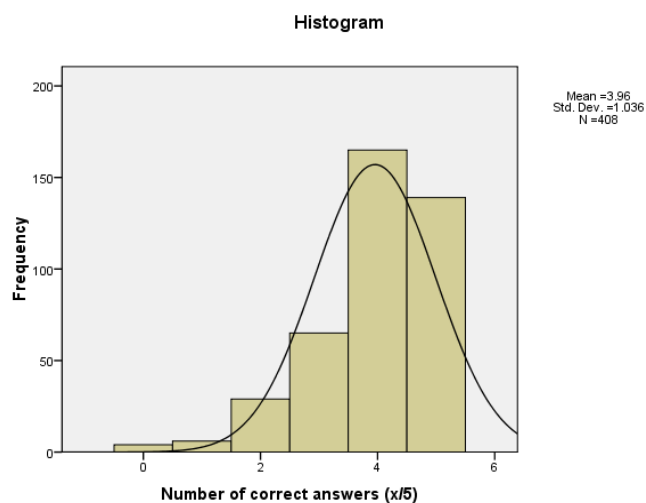


Figure 6.8: Overall distribution of responses

Overview of the Experiment

The experiment was conducted in both nations handled by a group of instructors within a time frame. The participants were categorised into two independent groups according to their nationalities, both groups received a clear briefing on the experiments by the instructors in Japan and Malaysia respectively. The medium of instruction was Japanese to Japanese participants and English for Malaysian participants verbally via default platform. The two independent groups were then separated into two sub-groups to receive different training methods. For instance, one sub-group received a safety method with verbal explanation, texts and pictures; while the other sub-group received only video contents without verbal explanation and no subtitle provided (Table 6.11). Each of the participants required to undergo an assessment after the safety training immediately. The assessment was using *Google* form to control the response time. The time spent on the safety training and assessment for each sub-group is approximately one hour.

Table 6.11: Experiment population

Group	Population	Received training method in		
		Verbal	Non-verbal	total
1	Malaysian undergraduates	33	32	65
2	Japanese undergraduates	36	35	71
	Total	69	67	136

Table 6.12: Mann-Whitney U test between nationality for both methods

Methods		Verbal			Non-verbal		
Contents		PPE	Work at height	Lifting / sling operation and site cleanliness	PPE	Work at height	Lifting / sling operation and site cleanliness
Mean rank	Group 1	31.44	28.56	32.76	30.73	26.98	24.17
	Group 2	38.26	40.9	37.06	36.99	40.41	42.99
Mann-Whitney U		476.5	381.5	520	455.5	335.5	245.5
Wilcoxon W		1037.5	942.5	1081	983.5	863.5	773.5
Z		-1.564	-2.703	-0.99	-1.477	-3.122	-4.688
p-value (<0.05)		0.118	0.007	0.322	0.14	0.002	0.000

The assessment questions were designed according to the safety training contents produced by *Planex*, Japan. The single-answer multiple choice questions (MCQs) with four options were used as the assessment with the reference of the health, safety and environment test for operatives and specialists published by Construction Industry Training Board (CITB), UK. MCQs is widely used in higher education for the high reliability, rapidity and openness to item analysis (Denhad et al., 2014). It enables students to determine how well the students understand the material being tested and allows the students to succeed when they have the requisite knowledge. The trial questions were formed and reviewed by three experts.

The questions were set according to the safety training sections (five questions per section). The questions were prepared in Japanese and English to suit all the participants to eliminate the language issue. The participants were requested to answer the questions via *Google* form given by the instructors after the safety training. Each participant answered one question correctly and counted toward the average score for each section.

Data Analysis

The obtained data were statistically analysed using Statistical Package for the Social Sciences (SPSS, version 16.0). The mean rank of the correct answers from the safety training methods among the groups is analysed.

Discussion of the Analysis of Findings

The test scores obtained from the questions were compared in two ways to determine the immediate effectiveness of both training methods. The first method was comparing the test scores for verbal and non-verbal training methods among the groups. The average score points among the three sections scored by the participants ascended as 10.94 (Group 1 verbal), 11.34 (Group 1 non-verbal), 12.03 (Group 2 verbal) and 13.06 (Group 2 non-verbal) out of 15 points. The participants scored 4 points and above (Group 1 verbal: 4.09, non-verbal: 4.31; Group 2 verbal: 4.31, non-verbal: 4.54) as the average score points under PPE. Next, the participants scored less satisfied (Group 1 verbal: 2.58, non-verbal: 2.84; Group 2 verbal: 3.28, non-verbal: 3.63) as the average score points under WaH.

Lastly, the participants scored 4 points and above (Group 1 verbal: 4.27, non-verbal: 4.19; Group 2 verbal: 4.44, non-verbal: 4.89) as the average score points under lifting operation and site cleanliness. The average scores for three sections as shown in Figure 6.9.

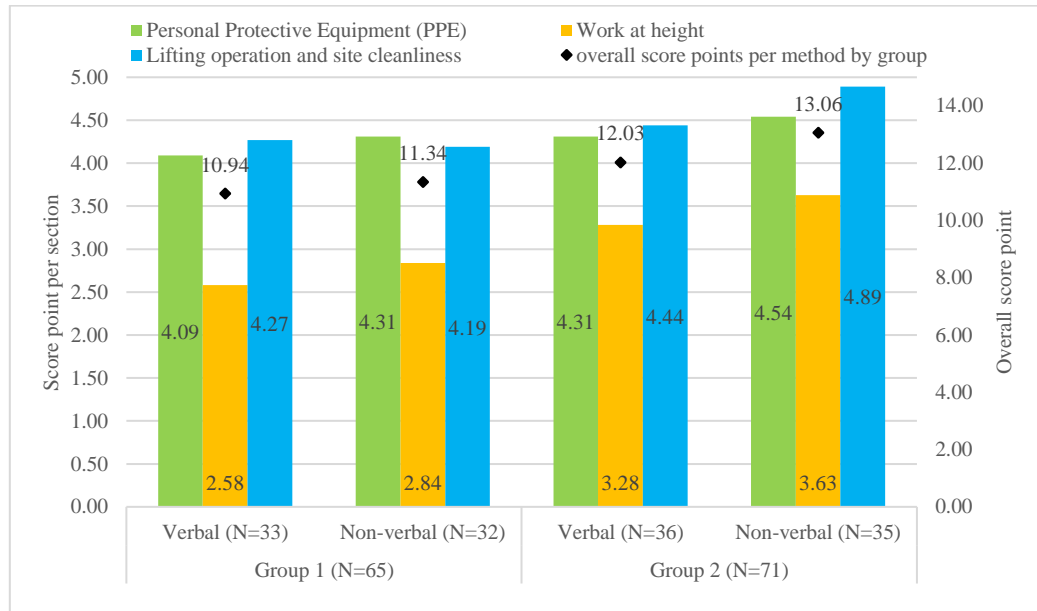


Figure 6.9: Overall score points between verbal and non-verbal methods

The Trend of Answers per Sections

The trend of answer for each question under PPE, WaH and lifting operation and site cleanliness shows in Figures 6.10 – 6.14, Figures 6.15-6.19 and Figures 6.20-6.24 respectively. The discussion will be arranged according to the sections.

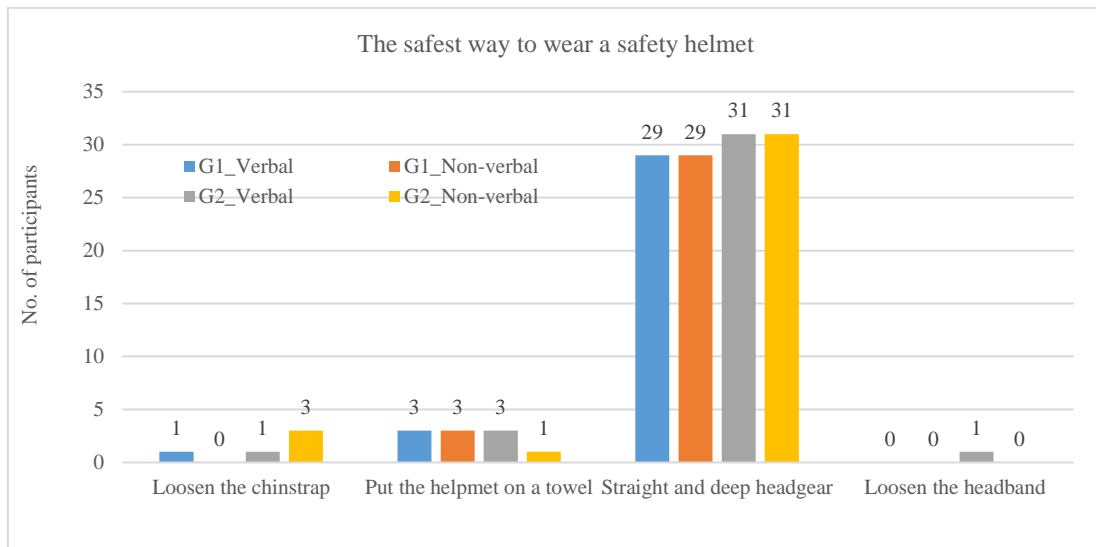


Figure 6.10: The safest way to wear a safety helmet

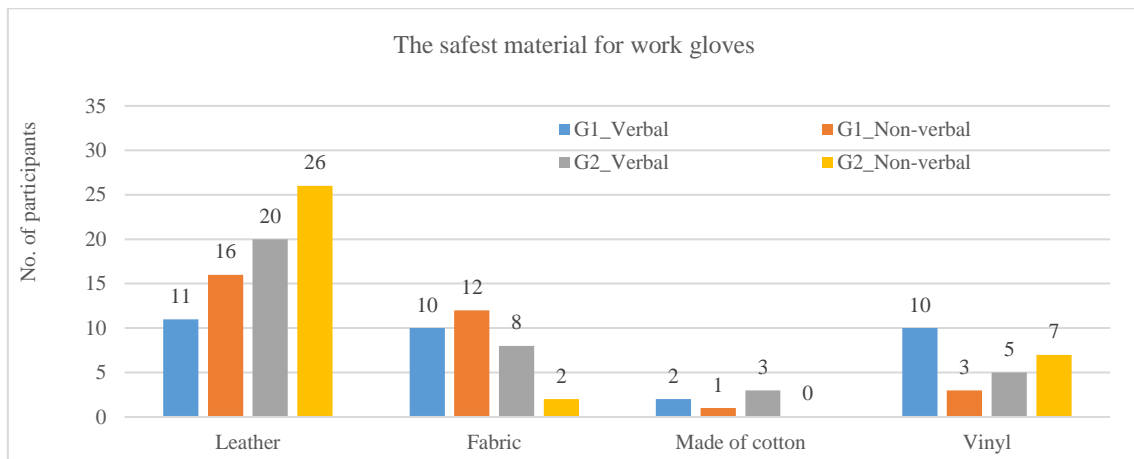


Figure 6.11: The safest material for work gloves

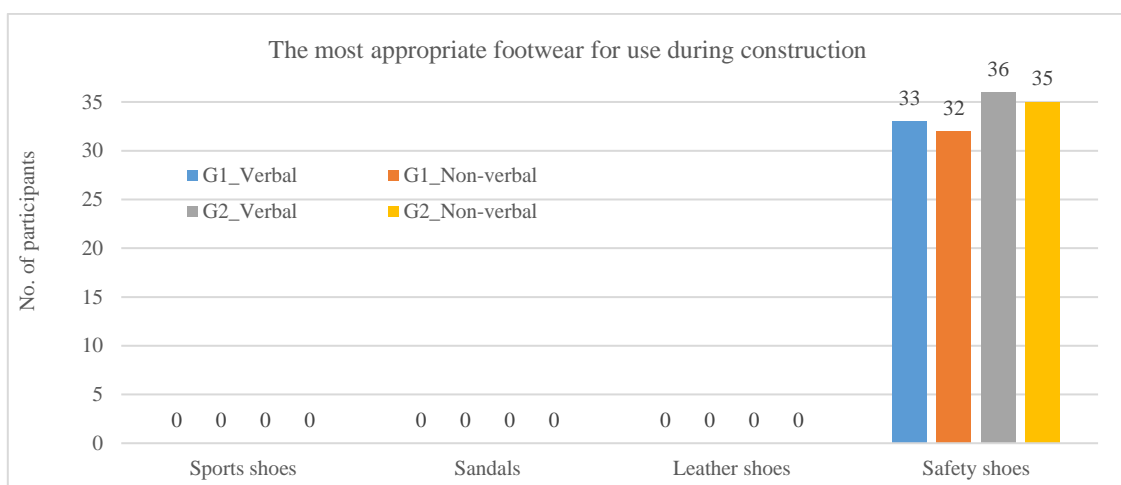


Figure 6.12: The most appropriate footwear for use during construction

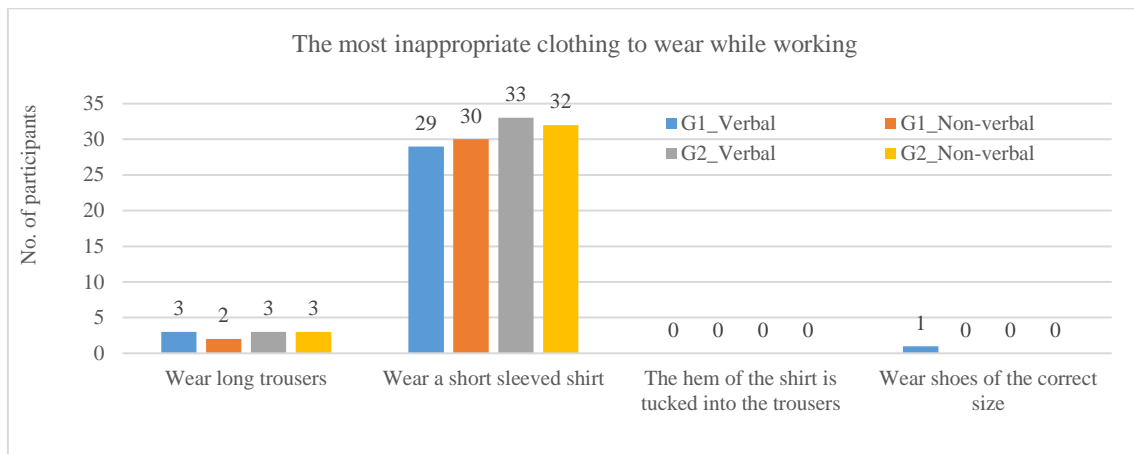


Figure 6.13: The most inappropriate work clothing

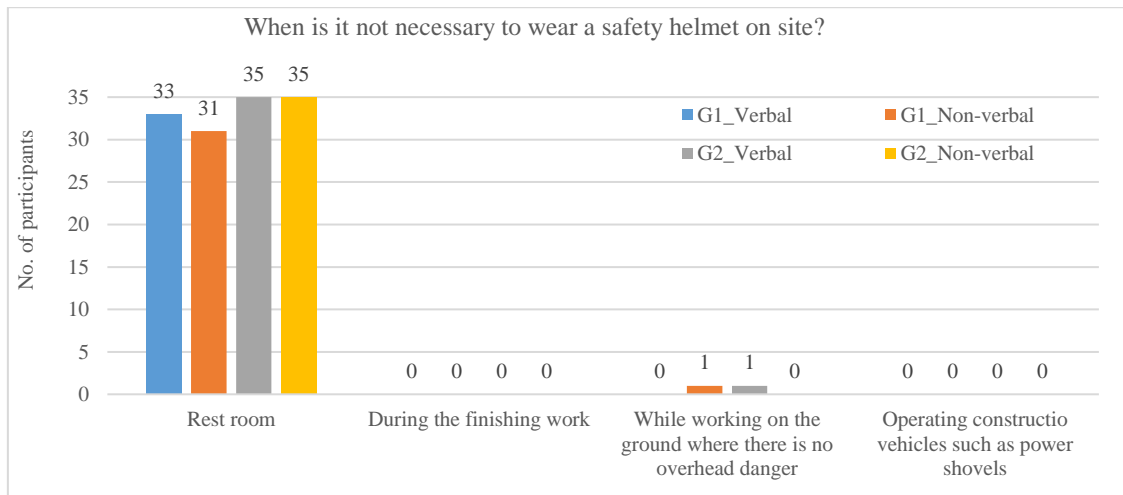


Figure 6.14: When is it not necessary to wear a safety helmet on site

Figure 6.10 – 6.14: Questions and trend of answers under PPE (Top to bottom)

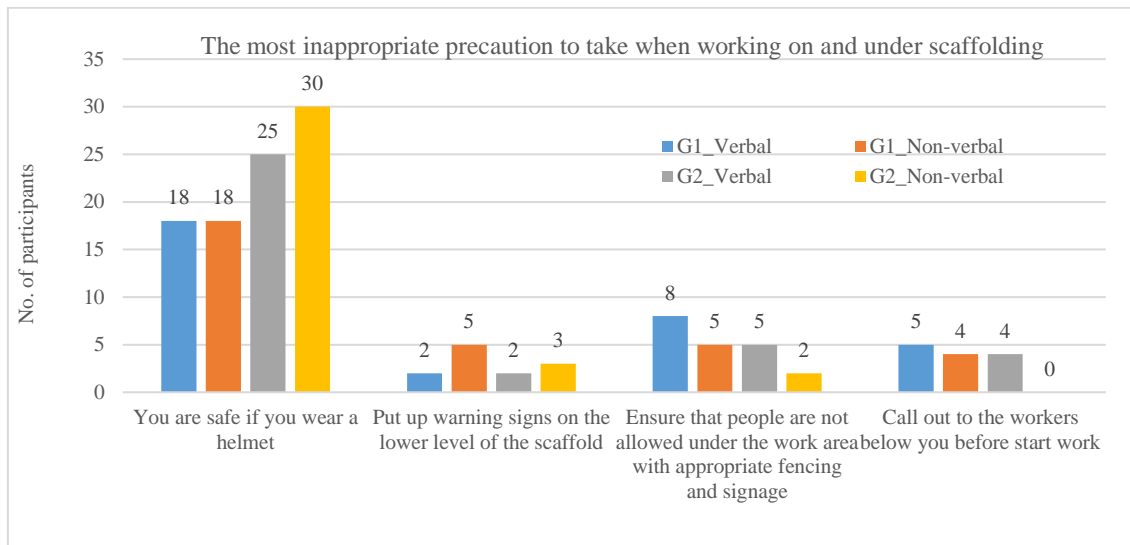


Figure 6.15: The most inappropriate precaution to take when working on and under scaffolding

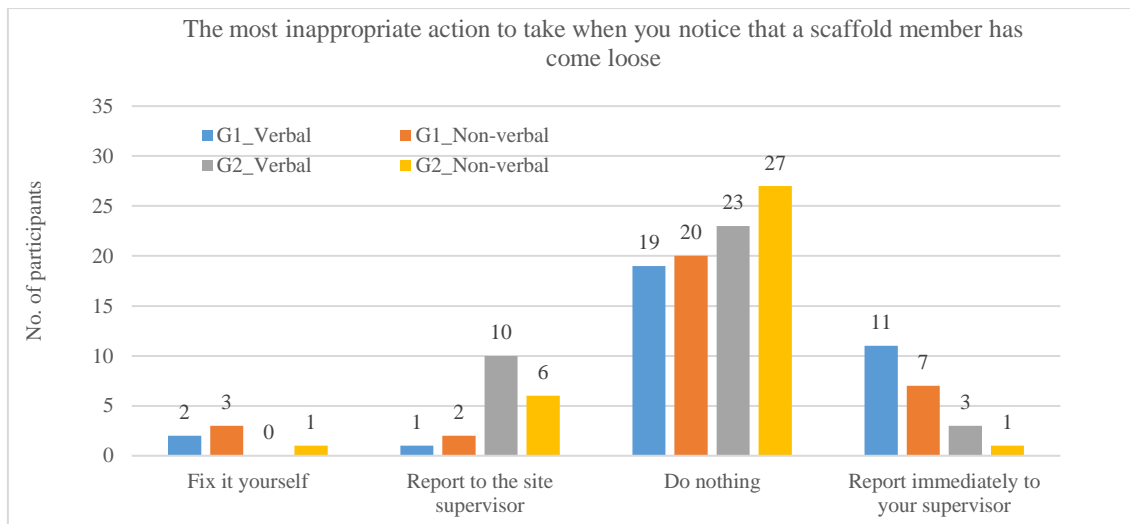


Figure 6.16: The most inappropriate action to take when you notice that a scaffold member has come loose

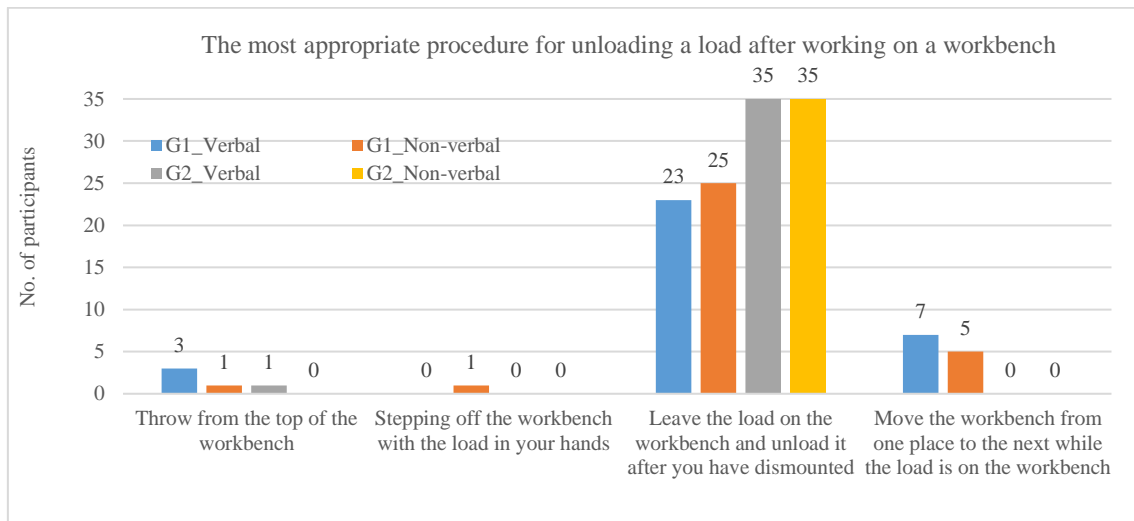


Figure 6.17: The most appropriate procedure for unloading a load after working on workbench

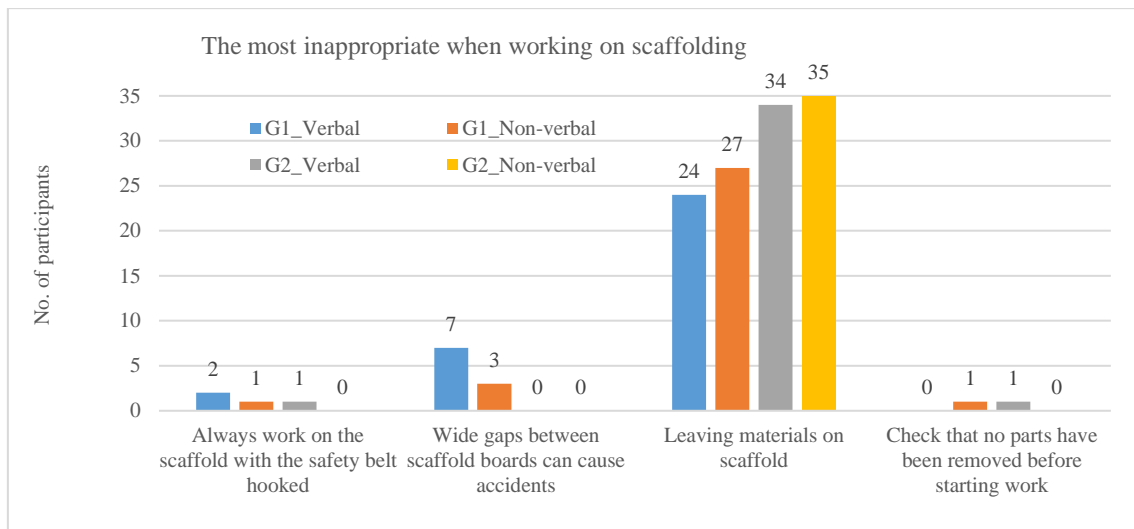


Figure 6.18: The most inappropriate when working on scaffolding

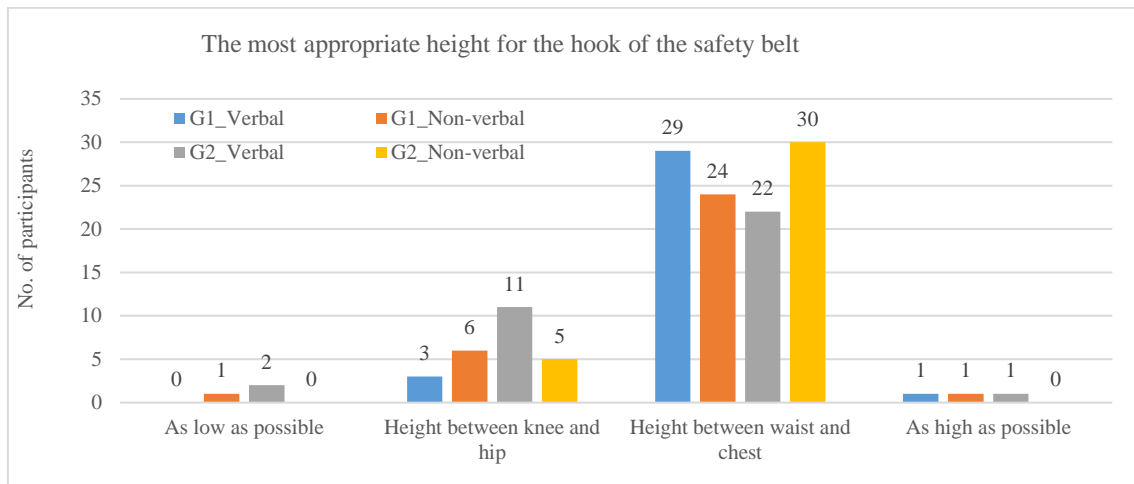


Figure 6.19: The most appropriate height for the hook of the safety belt

Figure 6.15-6.19: Questions and trend of answers under WaH (Top to bottom)

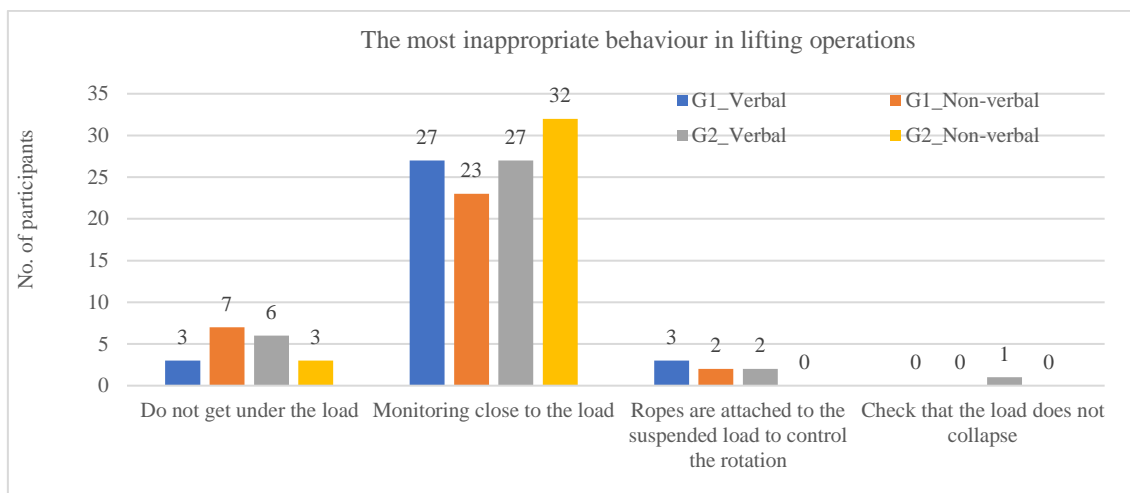


Figure 6.20: The most inappropriate behaviour in lifting operation

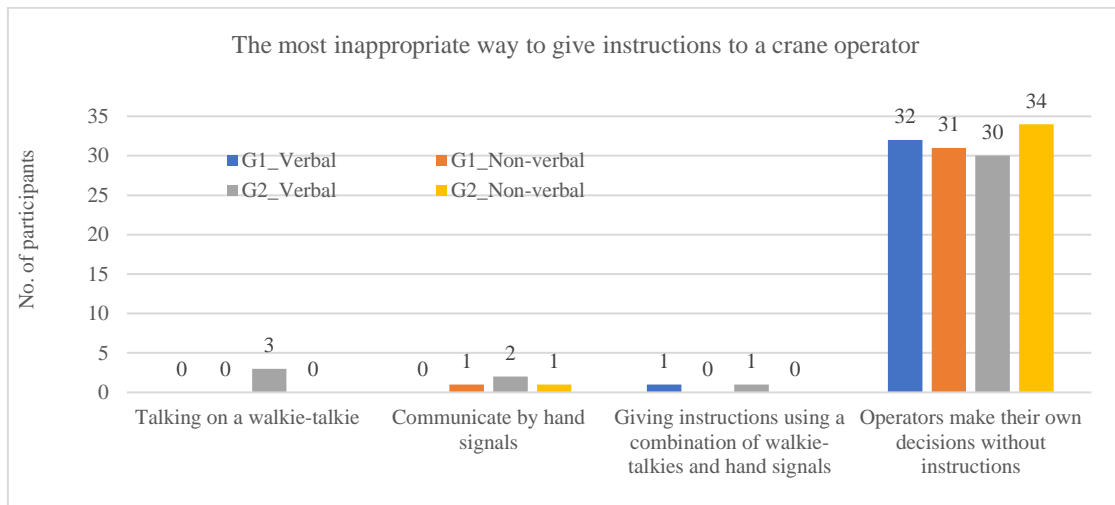


Figure 6.21: The most inappropriate way to give instructions to a crane operator

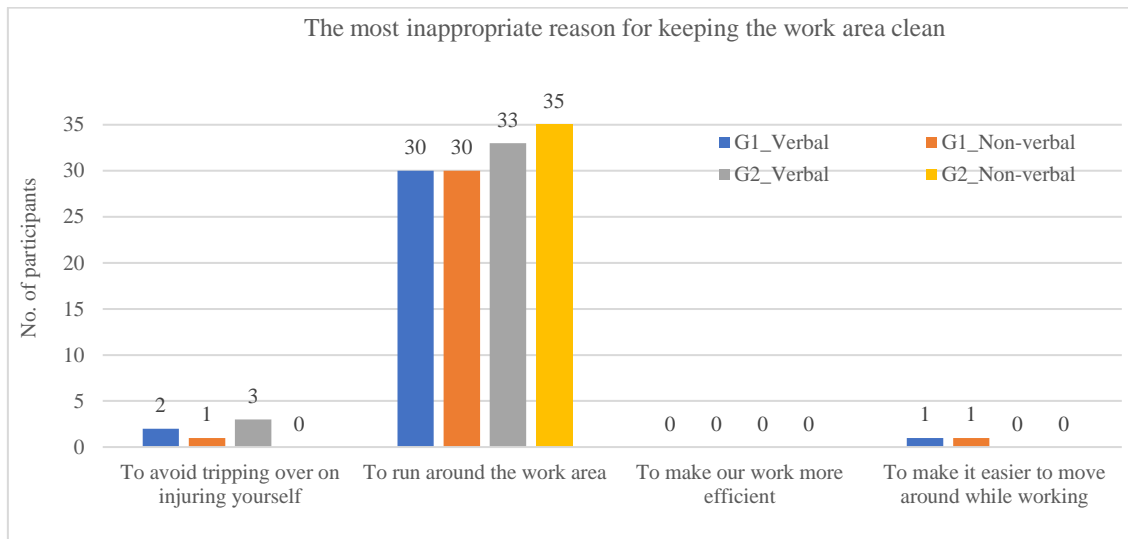


Figure 6.22: The most inappropriate reason for keeping the work area clean

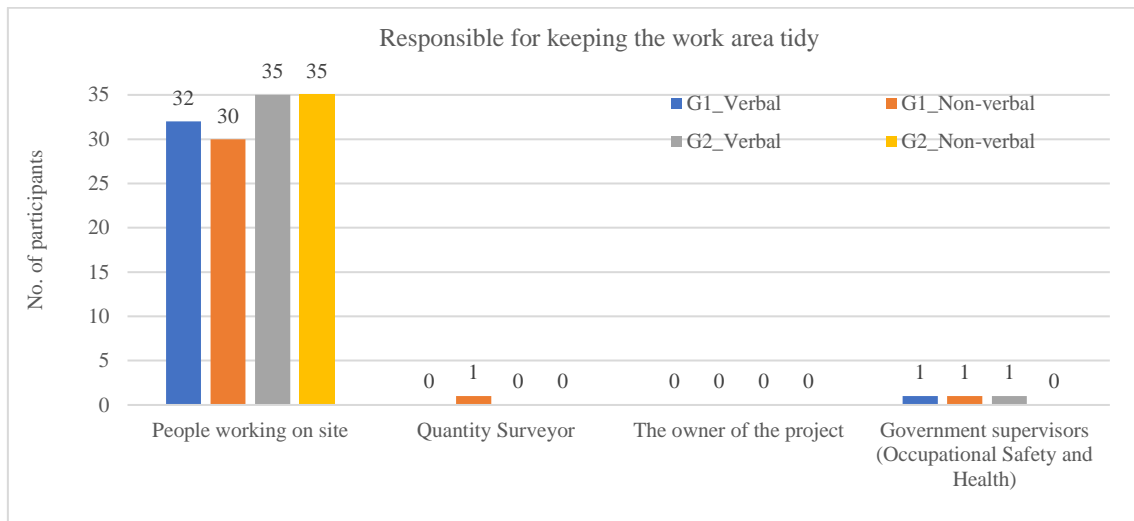


Figure 6.23: Responsible for keeping the work area tidy

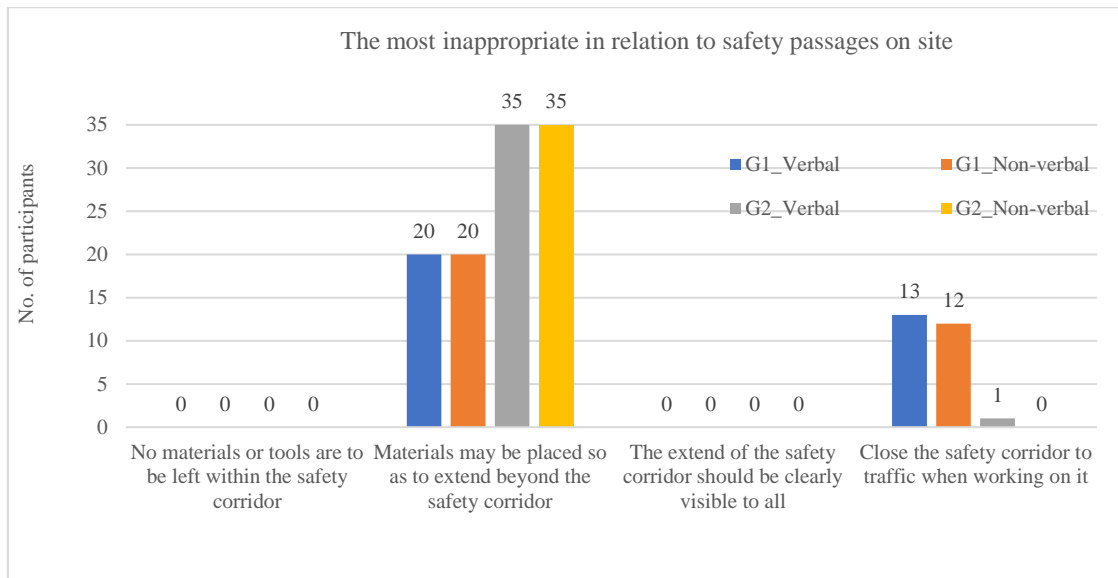


Figure 6.24: The most inappropriate in relation to safety passages on site

Figure 6.20-6.24: Questions and trend of answers under lifting operation (Top to bottom)

Personal Protective Equipment (PPE)

The first question, “*The safest way to wear a safety helmet*” was answered correctly to the answer “*straight and deep headgear*” by 88% and 94% of verbal and non-verbal from Group 1 respectively; 86% and 89% of verbal and non-verbal from Group 2 respectively (Figure 6.10). The second question, “*The safest material for work gloves*” was answered

correctly to the answer “*leather*” by 33% and 50% of verbal and non-verbal from Group 1; 56% and 74% of verbal and non-verbal from Group 2 respectively (Figure 6.11).

The following question “*The most appropriate footwear for use during construction*” was answered correctly by all participants (Figure 6.12). The next question, “*The most inappropriate clothing to wear while working*” was answered correctly to the answer “*wear a short-sleeved shirt*” by 88% and 94% of verbal and non-verbal from Group 1; 92% and 91% of verbal and non-verbal from Group 2 respectively (Figure 6.13). The last question “*When is it not necessary to wear a safety helmet on site?*” was answered correctly to the answer “*rest room*” by 100% and 97% of verbal and non-verbal from Group 1; 97% and 100% of verbal and non-verbal from Group 2 respectively (Figure 6.14).

Overall, the scores obtained from non-verbal groups are higher than the verbal groups among the participants under PPE. Most of the participants answered correctly for four questions under PPE except for the question “*The safest material for work gloves*”. The safety training content showed the work gloves to be used when carrying out tasks on site, however, about half of the participants, mainly from verbal groups, answered variations such as “*fabric*”, “*made of cotton*” or “*vinyl*” instead of “*leather*”.

Work at Height

Work at height is considered as one of the critical risks in most of the construction sites. The question, “*The most inappropriate precaution to take when working on and under scaffolding*” was answered correctly to the answer “*You are safe if you wear a helmet*” by 55% and 56% of verbal and non-verbal from Group 1; 69% and 86% of verbal and non-verbal from Group 2 respectively (Figure 6.15). The next question “*The most inappropriate action to take when you notice a scaffold member has come loose*” was answered correctly to the answer “*Do nothing*” by 58% and 63% of verbal and non-verbal under Group 1; 64% and 77% of verbal and non-verbal under Group 2 respectively (Figure 6.16).

The following question “*The most appropriate procedure for unloading a load after*

working on a workbench” was answered correctly to the answer *“Leave the load on the workbench and unload it after you have dismounted”* by 70% and 78% of verbal and non-verbal from Group 1; 97% and 100% of verbal and non-verbal from Group 2 respectively (Figure 6.17). The next question *“The most inappropriate when working on scaffolding”* was answered correctly to the answer *“Leaving materials on scaffolding”* by 73% and 84% of verbal and non-verbal from Group 1; 94% and 100% of verbal and non-verbal from Group 2 respectively (Figure 6.18). The last question *“The most appropriate height for the hook of the safety belt when working on the workbench”* was answered correctly to the answer *“as high as possible”* by 1 participant from verbal and non-verbal under Group 1 respectively, and 1 participant from verbal under Group 2 (Figure 6.19).

Unfortunately, all the participants obtained less scoring points for WaH regardless of the training methods, about 74% from verbal groups, 80% from non-verbal groups answered, *“height between waist and chest”* to the question *“The most appropriate height for the hook of the safety belt”*. In addition, some participants from Group 1 and Group 2 selected *“Fix yourself”*, *“Report to the site supervisor”* and *“Report immediately to your supervisor”* to the question *“The most inappropriate action to take when you notice that a scaffold member has come loose”*. Besides, some participants from Group 1 selected *“Move the workbench from one place to the next while the load is on the workbench”* and *“Throw from the top of the workbench”* to the question *“The most appropriate procedure for unloading a load after working on a workbench”*.

Lifting Operation and Site Cleanliness

Surprisingly, both groups scored higher on lifting operation and site cleanliness than the others, for both training methods. The first question, *“The most inappropriate behaviour in lifting operations”* was answered correctly to the answer *“Monitoring close to the load”* by 82% and 72% of verbal and non-verbal from Group 1; 75% and 91% of verbal and non-verbal from Group 2 respectively (Figure 6.20). The second question, *“The most inappropriate way to give instruction to a crane operator”* was answered correctly to the answer *“Operators make their own decisions without instructions”* by 97% of verbal and non-verbal from Group 1 respectively, 83% and 97% of verbal and non-verbal from

Group 2 (Figure 6.21).

The following question, “*The most inappropriate reason for keeping the work area clean*” was answered correctly to the answer “*To run around the work area*” by 91% and 94% of verbal and non-verbal from Group 1; 92% and 100% of verbal and non-verbal from Group 2 respectively (Figure 6.22). The next question, “*Responsible for keeping the work area tidy*” was answered correctly to the answer “*People working on site*” by 97% and 94% of verbal and non-verbal from Group 1; 97% and 100% of verbal and non-verbal from Group 2 (Figure 6.23). The last question, “*The most inappropriate in relation to safety passages on site*” was answered correctly to the answer “*Material may be placed so as to extend beyond the safety corridor*” by 61% and 63% of verbal and non-verbal from Group 1; 97% and 100% of verbal and non-verbal from Group 2 respectively (Figure 6.24).

Although some differences were found between the participants due to inexperienced and different cultures. For instance, some participants from Group 1 and Group 2 answered “*Do not get under the load*” and “*Ropes are attached to the suspended load to control the rotation*” to the question “*The most inappropriate behaviour in lifting operation*”. Also, about 40% of the Group 1 who received verbal and non-verbal methods answered “*Close the safety corridor to traffic when working on it*” to the question “*The most inappropriate in relation to safety passages on site*”. This might be due to different housekeeping practices in the Malaysian construction sites. However, the differences are insignificant as the score points from the participants from both training methods are high.

Non-verbalised Training Method

In terms of understanding, most of the participants were able to score 4 numbers of correct answers and above to the 3 sections for both training methods, especially the participants who received non-verbal training methods able to answer correctly to the questions (Figure 6.9). The results indicated the participants showed clear understanding toward the basic safety knowledge and were able to score high points for all sections after receiving the non-verbal safety training method rather than the verbal method regardless of

nationality. It can be claimed that the verbal method did clearly convey what needs to be said, but the respondents can only understand within the scope of the explanation which may not understand the content well enough to apply that knowledge (Arif et al., 2021) especially those without field experiences.

In terms of the effectiveness of the training method, the non-verbalized method provides a stronger impression of the level of danger to the respondents than verbal methods that make interested in what is being explained and transfers the related safety knowledge to the participants.

From Table 6.12, no significant differences found for PPE between the groups for verbal and non-verbal methods; also, there is no significant difference found for lifting operation under verbal method between the groups. Based on the responses, it was believed that there are no significant differences in basic knowledge of PPE, lifting operation and site cleanliness between the two groups, whereas, the participants performed similar understanding toward such safety knowledge.

Therefore, it can be claimed that the use of verbal or non-verbal methods of imparting such safety knowledge can have the same effect on the novices, regardless of their nationality. The use of such training methods is able to transfer the related safety knowledge to construction novices as proven by Brahm and Singer (2013).

However, there were significant differences ($p < 0.05$) found for WaH under verbal method between the Group 1 and Group 2; and WaH and lifting operation under non-verbal method between Group 1 and Group 2 (Table 6.12). The significant differences due to different safety cultures in both nations, can be noticed from the answers provided by the participants from Group 1 and Group 2 (Figure 6.15-6.19). For instance, the safe use of scaffolding and workbench on site are unfamiliar to the novices, especially to Group 1, as they tend to be more uncertain toward the WaH questions than Group 2. Most of the participants from Group 2 showed clear understanding toward the use of workbench and scaffolding on site, Therefore, the safety training contents are suggested to take into

account the needs of cultural differences to achieve better safety knowledge transfer.

Even the participants performed less satisfied in work at height section that might be due to misunderstanding during the safety training as these participants own no field experiences of using scaffolding and wearing the safety belt on site, yet, the scores obtained by the non-verbal groups were still higher than the verbal groups. Noticeable, the use of non-verbalised training methods enables the novices to understand the safety knowledge easily and effectively.

It should be noted that the safety training contents used in this experiment were produced by Japan to adapt the Japanese construction practices. Therefore, Japanese students tend to understand the contents easily by watching the pictures to understand the dangers in construction sites. From the results, Malaysian students showed different answers towards the questions under WaH and site cleanliness. Overall, Malaysian students scored slightly less points in both training methods for 3 sections as compared to Japanese students, as Malaysian students have less satisfied safety knowledge towards such safety knowledge. Some of the safety practices only occur in Japanese construction sites due to the uniqueness of the safety culture, for instance, the appropriate in relation to safety passages on site, this might not be familiar to the Malaysian construction industry, also, the Malaysian students are unfamiliar to the terms used in Japanese construction sites.

Since work at height is one of the high-risk activities on site, such training methods should continue to be strengthened and suit the construction site in both nations to enhance the risk recognition. Further research shall focus on the contents for high-risk activities that should be produced by the origin of the country to fulfil the safety culture and practices, to eliminate the cultural differences to have a better knowledge transfer among the novices.

6.12 Conclusion

This study provides an early phase of viewpoint on the effectiveness of verbal and non-verbal safety training materials through the assessment between different levels of education background, nationalities and field experiences of students and foreign workers in Japan and Malaysia. Most of the respondents were able to answer correctly for the general safety knowledge questions regardless of the training materials; while the undergraduates showed better performance in the non-verbal material; the verbal material tends to work well in inexperienced personnel in Japan based on the scored points. All of the respondents who underwent non-verbalized materials scored higher than verbalised materials in the work at height section. Majority of the scenario questions found no significant difference between the inexperienced personnel in Japan for both training materials. In view of the attitudes toward scenario questions, most of the Japanese students are able to show similar attitudes like the technical trainees toward most of the scenario questions. There are differences between nationalities in non-verbal materials especially among the foreign workers in Japan and Malaysia. The technical trainees who work in Japan showed more accurate responses in scenario questions than the Malaysian foreign workers who showed poor safety attitudes to several scenario questions due to different safety cultures, working environment and lack of proper construction safety education. Since, there is insignificant difference between verbal and non-verbal training materials among each individual group, yet, the results found evidence for the superiority of non-verbal over verbal training materials, although the difference was small. Non-verbal training was more effective in terms of providing a visual aid to standardise the impression of the safety contents which can resolve the problems such as language barriers and low level of literacy for foreign workers. It can be claimed that the non-verbal training material was more effective over a period of time especially in the context of work at height. In future research, non-verbal safety training content needs to be customised for hazardous situations on construction sites, and workers are trained in a visual way to enhance the ability in risk recognition to achieve better learning effects and promote industry safety education regardless of nationality. Researchers analysed majority of the construction accident and realised that in most accidents, the higher

educated the skilled workers, the lower the risk of fatal injury during the operation at the workplace; while with high level of experience among the skilled workers enable to reduce the fatal rate (Karimi and Taghaddos, 2019). Regular safety training should be carried out in routine to further enhance the worker's behaviours and safety knowledge.

6.13 Conclusion for Novices

The objectives were achieved through this comparative experiment. This study provides didactic findings that the construction novices showed good understanding for the basic knowledge of the use of PPE, work at height and lifting operation. Especially, the safety training content of PPE and lifting operation are useful and necessary to be conducted for the construction novices with either verbal or non-verbalised methods, since both methods enable the novices to understand basic safety knowledge clearly, regardless of nationality. Most novices were able to answer questions under the two components correctly. It can be interpreted that there are no significant differences in understanding the basic safety knowledge between the novices after both training methods. Therefore, providing construction novices with regular verbal or non-verbalized based safety training methods focused on PPE and lifting operations would be effective in educating construction novices on safety awareness.

In terms of teaching methods, to be specific, the verbal method is sufficient to be used for basic knowledge transfer such as PPE; while the non-verbal method is more effective to be used for high-risk activities such as work at height on sites. The use of non-verbalized based methods is effective among novices regardless of nationality. Particularly all the non-verbal sub-groups (Malaysian and Japanese students) scored higher points than verbal method in work at height after the training. The immediate results show the non-verbal method is sufficient to develop necessary risk recognition to train the novices for risk activities than verbal method, regardless nationality. The results showed there are no significant differences between construction novices with different nationalities. Noticeably, the video content needs to be customised for the scenes or situations that have not received much attention in Malaysia. As such a method is able to assist construction novices and practitioners to achieve better understanding towards high-risk activities and

the relevant construction site safety knowledge. There are needs of safety training towards high-risk activities such as work at height is an urge for construction novices especially to Malaysian construction novices to enhance the ability of risk recognition.

The importance of these basic construction safety training components should not be overlooked by the related educator and policy makers. The results of this experiment were conducted on the construction novices who are undergraduate students in construction related programs. This study could be used as references for the related educators and policy makers of safety education programs to design the teaching methods for high-risk activities so that workers from different backgrounds, with or without field experience, can learn effectively. For recommendation, further customised training content for high-risk activities such as work at height is necessary to suit the site safety culture in Malaysian construction industry.

Chapter 7 Conclusion

The study explored the key differences focused on the construction safety and health management and the construction site safety practices and safety training between Japan and Malaysia in order to obtain the usefulness practices in Japanese construction sites that can be implemented in Malaysian scenarios. Japan was chosen due to its remarkable improvement on the safety and health performance and the comprehensive safety and health regulatory framework.

This study was divided into two parts to better present the extent of similarities and differences between Japan and Malaysia in terms of construction safety and health management over the past decades. Firstly, the study discovers the thematic settings of a comparison of safety and health management in the construction industry between Japan and Malaysia. Secondly, the study explores a preliminary study on the effectiveness of safety training methods towards construction workers and novices in the building construction industry. To achieve the aim, six objectives were formed where the following sessions conclude on each objective respectively. To achieve the first part of the study, four objectives were formed to explore the key differences on construction safety and health management systems and the construction site safety practices in the Japanese and Malaysian construction industry to obtain the insights and challenges related to construction workforce, government policies and contractor practices faced by the construction industry. This was followed by the other two objectives to obtain the usefulness of the current construction safety and health practices and safety training toward workforces in the construction industry.

Objective 1: Identify the history and current status of construction occupational safety and health management in Japan and Malaysia

The development of occupational safety and health legislation began in the 1910s with factories and boilers as the main source of power; this was followed by industry safety, industrial safety and health, and finally occupational safety and health, which covers almost all industries in Japan and Malaysia. Both countries have started to pay attention to safety and health related issues in major economic activities in the early 1970s, and have promulgated various safety and health related laws, regulations, standards guidelines, and code of practice to manage the industries. In terms of construction industry, the act namely Industrial Safety and Health law (JISHA 1972) was promulgated in conjunction with the Labour Standards Act in Japan in 1970s; while The Occupational Safety and Health Act (Act 514) was promulgated in Malaysia in 1990s. There were 20 years between these countries. Although the Construction Industrial Standards (CIS) were promulgated before the Act was promulgated in Malaysia, yet, these guidelines are not legal standing as the Act endorsed by the government.

From the development of the construction industry, the government established several authorities to support the safety and health in the construction industry. The Malaysia and Japan government established the guidelines in accordance with the ILO-OSH 2001 (COHSMS in Japan; OSHMS in Malaysia) to further enhance and manage occupational safety and health related to the construction industry. The Japanese government has revised the guidelines several times to adapt them to the development of the construction industry and intend to make the guidelines better available for use by the contractors. The COHSMS of Japan stated the basic needs for principal contractors in detail, however, the GOSMCIM of Malaysia only stated the minimum roles and responsibilities of the client, contractor and designers. On the contrary, in the Malaysian construction industry, the guidelines are minimally in line with the international standards, rather than being “tailored” to the culture and development of the construction industry. As stated in the international guidelines, it is the “tailor-made” approach that will only reflect the benefits that the guidelines can bring. After all, each country faces different challenges such as the

ageing population in Japan; and the low-skilled or unskilled foreign workforce forms a high proportion of the workforce in Malaysia.

The disparities in the construction safety environment between Japan and Malaysia by focusing on the existing safety related system was clarified. The findings show that there is significant difference in micro perspective towards safety in construction between both nations. In terms of contractors and employers probably unaware of the potential commercial benefits of implementing the GOSHMS whereby the Malaysian contractors showed less willingness on voluntary initiatives on safety and health as Japanese contractors. From the scenarios, the contractors in Malaysia's construction industry are not too responsive to the programme initiated by the government. In contrast, the Japanese main contractors are committed to enforcing the regulations relating to site safety and are involved in almost all safety precautions. For developing countries, and particularly for contractors who bear most of the responsibility for safety on construction sites, it is important to understand the occupational safety and health environmental conditions in the construction industry that are commensurate with economic growth. Many Malaysia's construction companies or organisations are not as willing to take voluntary initiatives to improve the safety and health issues in the construction industry. The current use of the Occupational Safety and Health Act does not raise the level of awareness and practicability in Malaysia construction industry. Another reason for poor safety performance in the construction industry is that the penalty is way too low whereby the current maximum is not a deterrent which causes the importance of safety to be trivialised or disregarded. Therefore, a strong enforcement by DOSH is necessary. Japan's authorities' safety and health involvement is far more comprehensive than in Malaysia, in terms of ordinance, guidelines, education, training centre, major and minor safety and health related activities, government resources such as subsidies, and historical updates. In retrospect, it appears that the Malaysian government did not pay much attention to this aspect of safety management towards the construction industry as to how the Japanese government treated the construction industry as important as the other industries. Regulations are being updated and amended, but the construction fatality rate has not been effectively reduced, especially in developing countries.

Objective 2: Investigate the construction accident characteristics in Japan and Malaysia

According to the construction accident trends in Japan and Malaysia shown in Chapter 2, both countries have established safety and health organisations and departments to support safety and health related issues in the construction industry. In addition, governments have developed safety programmes to improve the safety in the construction industry, for instance, Japan's industrial accident prevention 5-year plan and Malaysia's occupational safety and health master plan (2005-2020) to reduce the construction casualties and fatalities, to raise the safety awareness among the employees and to create a safe workplace environment. However, the construction casualties and fatalities remain highest among all industries. The ratio of casualties in the construction industry to all industries is about 3 to 4 times higher in Japan than in Malaysia; while the percentage of fatality accidents in the construction industry to all industries is about 30% to 50% in both countries. Yet, the construction fatalities in Malaysia fluctuates seriously from year to year. Statistically, the frequency of construction accidents is high in Japan and Malaysia, especially the percentage of fatality accidents. Fall from height and struck, crushed and hit by are the critical fatal construction accident types found in both countries. Most of the fatal accidents occurred at temporary building structures without the fall prevention system in Japan. The root causes of these critical fatal construction accidents were identified as unsafe conditions due to the complex and unique nature of the industry with extensive use of machinery, materials and workforce; and unsafe acts such as lack of non-compliance work procedures, lack of personal protective equipment and lack of supervision and training in Malaysian context. Construction site safety is a complex phenomenon due to the fragmented nature of work processes, the involvement of a wide range of industries and many stakeholders, especially the construction workers who work in the construction sites on a daily basis. The average salaries earned by the construction workers is considered as underpaid and this is running the opposite direction to become a high-income developing country. The current Malaysian construction industry is restricted by the low-wage and low efficiency due to the extensive dependence on low-

skilled or unskilled foreign workers.

Workforce issues in construction industry	Japan	Malaysia
Distribution of employed persons of total employment	7.1%	9.1%
Distribution by age group majority involved	35 – 65 and above	Not available
Distribution by gender	Male dominated	Male dominated
Foreign workers ratio	3.48% in 2019	Not available
Foreign workers nationalities involved	Vietnam, China, Philippines	Indonesia, Bangladesh, Myanmar (<i>unofficial</i>)
Requirement to be recruited as foreign workers	Technical Intern Program	Not specific.
Wages distribution (regardless citizenship)	Higher than the average of 338,000 thousand yen in 2019 (Highest among all industries in Japan)	Below the average wages of MYR 3,005 in 2021 (Second lowest after agriculture sector among all industries in Malaysia)
Current issues	-Ageing population whereby young generation refuse to join construction; -High entry requirement of foreign workforce to join construction	Low-skilled or unskilled foreign workforce with legal or illegally forms high proportion; Low entry requirement of foreign workforce to join construction, but high levy payment; Low awareness of upgrading skills

Objective 3: Determine the factors contributed to the construction accidents in Malaysia

The existing safety and health assessment is mainly concentrated on the noticeable outcomes such as the trend of accident statistics, critical accident types, related accident and safety issues reported on news and so on. Therefore, investigating the factors contributing to construction accidents could be useful for accident prevention as to promote easy implementation and immediately effective safety performance. The common factors that contributed to the construction accidents such as failure to recognize safety hazards, attitude towards misuse of PPE, failure to follow safety procedure during operation, improper supervision and safety control, lack of safety knowledge and training, dangerous required working actions during machinery operations, irregularly assigned tasks, cluttered working environment with surrounding object or structures, poor working surface conditions and exposure to hazardous injury source were determined. The critical factors contributed to the construction accidents namely failure to recognize safety hazards, attitudes towards not wearing PPE and lack of safety knowledge and training were further identified by the construction site personnel in Malaysia context.

The current Malaysian construction industry scenario was discovered to provide a clear understanding towards the current situation of construction safety and health related issues in Malaysia. In terms of workforce, most of the construction site is constituted by young age foreign workers from Indonesia, Bangladesh, Vietnam, Myanmar, and Pakistan. However, the construction persons are not satisfied with the working attitude of them due to their poor communication skills. According to the existence law and regulation of the Department of Immigration Malaysia, Bangladesh is only allowed to work under the plantation sector in Malaysia. This indirectly proves that there is a major loophole in the management of foreign workforce in Malaysia, whereby the whereabouts of foreign workers after their entry into the country is unknown and out of control. The movement of foreign workers appears to be unregulated and ineffectively controlled.

In terms of the safety and health related activities such as toolbox meetings, various training, work procedures, education and education for newcomers are conducted in most

of the construction sites. However, activities such as education at the time of employment, information sharing, dangerous machine and materials education are not common in construction sites, due to low awareness of safety where most construction site persons thinks that the unsafe conditions and actions at sites will not decrease due to limited budget allocation and lack of resources for safety activities and prioritisation of production over safety. The possibility was ascertained that the implementation of the current construction safety activities does not meet the needs of construction site employees. The findings showed that the employees tended to be aware that the construction site accidents affect workers and their own behaviour, the site environment is an obstacle to OSH programme and that construction site accidents affect project and company profits, which is a common perspective regardless of size of the company. These problems at construction sites can be interpreted as improving communication with foreign workers, enhancing the content of safety and health education, and being aware of good relationships with stakeholders.

Objective 4: Categorise the challenges related to the occupational safety and health practices in construction industry

The current situation of construction safety and health related issues in Malaysian context was exemplified to enhance knowledge among construction stakeholders and figure out various effective solutions to solve the current issues. Firstly, the critical barriers to implementing OSH practices on construction sites in Malaysian context were identified as lack of budget allocation for OSH programme, prioritisation of production over safety and lack of effective communication. To further discover the effective site safety measures and accident prevention methods implemented in Japanese construction sites that can be used in the Malaysia construction industry. The common on-site accident prevention methods that can be implemented in Malaysian context are morning assembly with toolbox meeting, risk prediction activity, regular safety meetings, regular patrol system, verbal explanation on safety rules and regulations, repetitive reminders among the co-workers and so on. These humane practices can better enhance the safety awareness of foreign workers during operations which are expected to be useful in Malaysia.

The safety and health issues in the construction industry were investigated through the current in-house practices of main contractors implemented in the construction sites to address the safety and health influence with the intention of obtaining several perspectives as to other mechanisms which could complement the mitigation offered by the regulations. The findings through on-site observation and semi-structured interviews realized that the existing safety management practices in Japanese construction sites covers the Plan-Do-Check-Act (PDCA) cycle, the implementation of safety work cycle, risk assessment *Kiken Yochi* (KY) meeting, safety meeting schedule including daily, weekly and monthly basis, the responsibilities of contractor and subcontractors, safety education for newcomers, the documentation on safety procedures on sites, disasters and accident cases updates (Accident calendars board), on-site communication tools for safety concerns. The contractor takes voluntary initiatives to implement approaches to tackle the construction safety issues meanwhile to maintain good safety practices on site. Most notably the main

contractor is responsible for the safety of the entire site, however, subcontractors are responsible for the safety of their own workers in Japanese construction sites. In order to obtain better communication for safety concerns equal sharing of risk during the operation between main contractor and subcontractors. The accident prevention methods implemented in the Japanese construction industry provide a good example to be learned from.

Objective 5: Compare the construction site safety management practices focused on foreign workers in Japan and Malaysia

The site safety measures in construction sites and the perspectives of government agencies and construction site personnel towards the current safety related issues, particularly focusing on the foreign workers in both nations were compared. The on-site safety measures such as general safety measures, personal protective equipment (PPE), fall prevention system, fire prevention measures, wasted materials storages, safety meetings, etc. are significantly important in the eyes of Japanese builders. The foreign construction workers in the construction industry are less satisfied, especially toward their ability in communication skills, low level of safety knowledge and safety awareness in both nations regardless of their nationalities due to different cultural and language barriers. Therefore, from the perspectives of government agencies and construction site personnel in both nations, the safety training must not be neglected among the foreign construction workers. The effective safety activities toward foreign construction workers are education of unsafe acts; safety education before assignment to construction sites; information sharing (case studies and discussion); correct work procedures; dangerous materials and machinery education and safety usage of tools and machinery. Since the language ability must be improved in this case, the safety training method must cover the shortcoming of the language barrier. The consideration of the critical safety training contents namely safety education on fall prevention, slinging operation and work procedures; and teaching methods namely sharing videos by DVD will further examine the usefulness among foreign workers and construction novices.

Objective 6: Investigate the effectiveness of safety training methods towards construction novices and foreign workers from different nations in Japanese and Malaysian construction industry

In the previous chapter, the teaching methods and teaching materials for safety training which are effective for foreign construction workers as well as the critical safety training contents required to be improved were identified by the government agencies and the construction site personnel. This chapter examined the effectiveness of which teaching methods are useful to foreign construction workers and construction novices to provide a comparative point of view. An early phase of viewpoint on the effectiveness of verbal and non-verbal safety training materials through the assessment between different levels of education background, nationalities and field experiences of students and foreign workers in Japan and Malaysia were studied. The teaching contents were selected based on the high frequency of high-risk activities on construction sites. This study provides an early phase of viewpoint on the effectiveness of verbal and non-verbal safety training materials through the assessment between different levels of education background, nationalities and field experiences of students and foreign workers in Japan and Malaysia. There are differences between nationalities in non-verbal materials especially among the foreign workers in Japan and Malaysia. The technical trainees who work in Japan showed more accurate responses in scenario questions than the Malaysian foreign workers who showed poor safety attitudes to several scenario questions due to different safety cultures, working environment and lack of proper construction safety education. In future research, non-verbal safety training content needs to be customised for hazardous situations on construction sites, and workers are trained in a visual way to enhance the ability in risk recognition to achieve better learning effects and promote industry safety education regardless of nationality. Regular safety training should be carried out in routine to further enhance the worker's behaviours and safety knowledge.

Therefore, it can be claimed that the use of verbal or non-verbal methods of imparting such safety knowledge can have the same effect on the novices, regardless of their nationality. The use of such training methods is able to transfer the related safety

knowledge to construction novices. In terms of the effectiveness of the training method, the non-verbalized method provides a stronger impression of the level of danger to the respondents than verbal methods that make interested in what is being explained and transfers the related safety knowledge to the construction foreign workers and construction novices. Since work at height is one of the high-risk activities on site, such training methods should continue to be strengthened and suit the construction site in both nations to enhance the risk recognition. The importance of these basic construction safety training components should not be overlooked by the related educator and policy makers.

Conclusion

Japan and Malaysia have started to pay attention to safety and health related issues in major economic activities in the early 1970s, and have promulgated various safety and health related laws, regulations, standards guidelines, and code of practice to manage construction industry, yet, there were 20 years between Japan and Malaysia. The disparities in the construction safety environment focusing on the existing safety related system show significant difference in micro perspective between both nations. Especially, the guidelines are minimally in line with the international standards, rather than being “tailored” to the culture and development of Malaysian construction industry. Although the construction casualties and fatalities remain highest among all industries in both countries, yet, the construction fatalities in Malaysia fluctuates seriously from year to year. The critical factors contributed to the construction accidents namely failure to recognize safety hazards, attitudes towards not wearing PPE and lack of safety knowledge and training were further identified by the construction site personnel in Malaysia context, and the critical barriers to implementing OSH practices on construction sites in Malaysian context were identified as lack of budget allocation for OSH programme, prioritisation of production over safety and lack of effective communication. This is due to the current Malaysian construction industry being restricted by the low-wage and low efficiency due to the extensive dependence on low-skilled or unskilled foreign workers. Malaysian contractors and employers showed less willingness on voluntary initiatives on safety and

health as Japanese contractors, while, Japanese main contractors are committed to enforcing the regulations relating to site safety and are involved in almost all safety precautions. In addition, the foreign construction workers in the construction industry are less satisfied in the eyes of local site personnel, especially toward their ability in communication skills, low level of safety knowledge and safety awareness in both nations regardless of their nationalities due to different cultural and language barriers. However, the on-site safety measures are significantly important in the eyes of Japanese builders, especially, the safety training must not be neglected among the foreign construction workers and the language ability must be improved, therefore, the safety training method must cover the shortcoming of the language barrier. Japan has remarkable achievements in non-verbal safety training and teaching materials. This study confirmed that the use of non-verbal teaching methods is useful for foreign construction workers and novices in both nations, however, the safety training content needs to be customised for hazardous situations on construction sites, and workers are trained in a visual way to enhance the ability in risk recognition to achieve better learning effects and promote industry safety education regardless of nationality. The Japanese construction industry has been finding ways to enhance the safe work education for all workers including foreigners who work in the industry. In keeping with the “Look East Policy” and human rights, this means that Malaysia encourages to learn the above practices and attention from Japan, especially with regard to the safety of construction site employees, regardless their nationality, with care and scrutiny, as the labour force plays a vital role in the country’s development.

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Appendices

- 1) Appendix A: Multiple Choice Questions (60 questions)
- 2) Appendix B: Interview Questions
- 3) Appendix C: Responses from the Interviewees (Sample 1: Japan) & (Sample 2: Malaysia)

Appendix A: Multiple Choice Questions (60 questions)

Test questions after verbal&non-verbal safety training education
Prepared by: TanZY

June 2021

Name:
ID:
Score: _____ /60

This test consists of 3 sections with a total of 60 questions. Each section consists of 2 parts. Carefully read each questions and then select the correct answer. Please complete all the questions.

Section 1: Personal Protective Equipment (PPE)

Part 1: General knowledge on wearing PPE

1. Which is the safest way to wear a helmet
 - a. Loosen the chinstrap.
 - b. Put the helmet on a towel.
 - c. Straight and deep headgear
 - d. Loosen the headband.
2. Which is the safest material for work gloves?
 - a. Leather
 - b. Fabric
 - c. Made of cotton
 - d. Vinyl
3. Which of the following is the most appropriate footwear for use during construction?
 - a. Sports shoes
 - b. Sandals
 - c. Leather shoes
 - d. Safety shoes
4. What is the most inappropriate clothing to wear while working?
 - a. Wear long trousers.
 - b. Wear a short-sleeved shirt.
 - c. The hem of the shirt is tucked into the trousers.
 - d. Wear shoes of the correct size.
5. When is it not necessary to wear a safety cap on site?
 - a. Rest room
 - b. During the finishing work.
 - c. While working on the ground where there is no overhead danger.
 - d. Operating construction vehicles such as power shovels.

Appendix A: Multiple Choice Questions (60 questions) (Continued)

Test questions after verbal&non-verbal safety training education

Prepared by: TanZY

June 2021

Part 2: Scenario questions on PPE

1	2	3	4	5	6	7
Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree

6. Safety helmets are useless in case of a fall.
7. It is safer to wear a helmet with a towel wrapped around your head.
8. Helmet chinstrap should be left loose.
9. No more crashes from scaffolding simply by wearing a safety belt.
10. It is safer to wear cotton gloves when cutting the materials.
11. Only carelessness can cause injuries when cutting boards with cutters.
12. You may wear sandals when working, as long as you are not working on the scaffold.
13. It is alright to wear short trousers when working on the interior.
14. The height at which the safety belt hooks should be attached as low as possible.
15. Full harness fastenings are safer when attached to the chest.
16. When cutting pipes, it is safe to do so without the use of special tools.
17. No matter how hot it is, you should wear long sleeves on construction sites.
18. If you sweat a lot, it is good to work with a towel around your necks.
19. Wearing socks can help to prevent injury.
20. Never work with the chin strap of the helmet unfastened.

Section 2: Work at height

Part 1: General knowledge on work at height

21. Which of the following is the most inappropriate precaution to take when working on and under scaffolding?
 - a. You are safe if you wear a helmet
 - b. Put up warning signs on the lower level of the scaffold.
 - c. Ensure that people are not allowed under the work area with appropriate fencing and signage.
 - d. Call out to the workers below you before start work.
22. Which of the following is the most inappropriate action to take when you notice that a scaffold member has come loose?
 - a. Fix it yourself
 - b. Report to the site supervisor
 - c. Do nothing
 - d. Report immediately to your supervisor
23. Which is the most appropriate procedure for unloading a load after working on a workbench?
 - a. Throw from the top of the workbench
 - b. Stepping off the workbench with the load in your hands
 - c. Leave the load on the workbench and unload it after you have dismounted
 - d. Move the workbench from one place to the next while the load is on the workbench
24. Which of the following is the most inappropriate when working on scaffolding?
 - a. Always work on the scaffold with the safety belt hooked
 - b. Wide gaps between scaffold boards can cause accidents
 - c. Leaving materials on scaffold
 - d. Check that no parts have been removed before starting work

Appendix A: Multiple Choice Questions (60 questions) (Continued)

Test questions after verbal&non-verbal safety training education
Prepared by: TanZY

June 2021

25. What is the most appropriate height for the hook of the safety belt?
- a. As low as possible
 - b. Height between knee and hip
 - c. Height between waist and chest
 - d. As high as possible

Part 2: Scenario questions on work at height

1	2	3	4	5	6	7
Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree

- 26. You may start work even if there is a worker under you on the scaffold.
- 27. It is safe to move the workbench without folding it.
- 28. There is a risk of falling if you step off the workbench while carrying a load in one hand.
- 29. It is safe to work on the scaffold without hooking the safety belt.
- 30. The hook of the safety belt should be hooked at a height below the waist.
- 31. It is dangerous to work on the edge of the workbench.
- 32. In scaffold assembly work, it is not necessary to hook up safety belts if you are only moving on the scaffold.
- 33. Cutters need to be used on a stable platform.
- 34. You should not wear a leather gloves when cutting boards with a cutter.
- 35. It is dangerous to use power tools while carrying out other tasks.
- 36. I hooked my safety belt on the same rope as the worker next to me.
- 37. It is better to use a full harness safety belt when working at height.
- 38. The use of specialist tools can help to prevent injury.
- 39. The end of the workbench must be fitted with a stopper to prevent falling from height.
- 40. If it is low enough, even a small crash can kill you.

Section 3: Lifting operations and site cleanliness

Part 1: General knowledge about lifting operations and site cleanliness

- 41. Which is the most inappropriate behaviour in lifting operations?
 - a. Do not get under the load
 - b. Monitoring close to the load
 - c. Ropes are attached to the suspended load to control the rotation
 - d. Check that the load does not collapse
- 42. Which of the following is the most inappropriate way to give instructions to a crane operator?
 - a. Talking on a walkie-talkie
 - b. Communicate by hand signals
 - c. Giving instructions using a combination of walkie-talkies and hand signals
 - d. Operators make their own decisions without instructions
- 43. Which of the following is the most inappropriate reason for keeping the work area clean?
 - a. To avoid tripping over on injuring yourself
 - b. To run around the work area

Appendix A: Multiple Choice Questions (60 questions) (Continued)

Test questions after verbal&non-verbal safety training education
Prepared by: TanZY

June 2021

- c. To make our work more efficient
 - d. To make it easier to move around while working
44. Who is responsible for keeping the work area tidy?
- a. People working on site
 - b. Quantity Surveyor
 - c. The owner of the project
 - d. Government supervisors (Occupational Safety and Health)
45. Which of the following is most inappropriate in relation to safety passages on site?
- a. No materials or tools are to be left within the safety corridor
 - b. Materials may be placed so as to extend beyond the safety corridor
 - c. The extend of the safety corridor should be clearly visible to all
 - d. Close the safety corridor to traffic when working on it

Part 2: Scenario questions on lifting operations and site cleanliness

1	2	3	4	5	6	7
Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree

- 46. Tidiness on the construction site helps to prevent accidents.
- 47. After using machines and tools, the user is responsible for cleaning up.
- 48. It is a waste of time to clean your work area afterwards.
- 49. It is best to stay as close to the load as possible when lifting.
- 50. Lifting operations should be carried out by experienced workers if possible.
- 51. It is safe to work near to the construction machinery.
- 52. Work can be done more efficiently when the work area is tidy and organized.
- 53. Materials and tools are stored in an organized way and it can be searched efficiently.
- 54. If the work area is dirty, it is easy to trip over it when working.
- 55. Materials stored in the safety corridor can lead to injury.
- 56. The area around the construction machinery at work should be off-limits.
- 57. The wire rope should be checked for damage before lifting operations are carried out.
- 58. Even if you have to work in the same place tomorrow, you should clean your work area afterwards.
- 59. When unloading with a crane, it is better to stay close to the load.
- 60. When unloading with a crane, it is not dangerous to hold the crane by hand when it shakes if it is in a low position.

_____ End _____

Appendix B: Interview Questions

Interview with xxxxxxx Oct 2022 – Oct 2023

General questions: 一般的な質問:

Working experiences in construction industry. 建設業界での実務経験

Response: 応答:

Q1: General point of view towards the current safety and health in construction industry.

Q1: 現在の建設業界における安全衛生について、あなたはどのように考えていますか?

Response: 応答:

Q2: What trends do you think in the situation of foreign workforce in construction industry compared to the past 5 years?

Q2: 建設業界における外国人労働者の状況は、過去 5 年間で比べてどのように見えますか?

Increase tendency 増加傾向	
Remain (flat) そのまま (フラット)	
Decreasing tendency 減少傾向	

Please tick (✓) the relevance.
該当するボックスにチェックを入れてください(✓)

What is your opinion towards to above situation?

上記の状況についてどう思いますか?

Q3: What do you think in the situation of construction accident compared to the past 10 years? The construction accident trend is in the situation of:

Q3: 過去 10 年間で比べて、建設事故の状況をどう思いますか? 建設事故の傾向は次のような状況です。

Increase tendency 増加傾向	
Remain (flat) そのまま (フラット)	
Decreasing tendency 減少傾向	

Please tick (✓) the relevance.
該当するボックスにチェックを入れてください(✓)

What is your opinion towards to above situation?

上記の状況についてどう思いますか?

Appendix B: Interview Questions (Continued)

Interview with xxxxxxxx Oct 2022 – Oct 2023

Q4: Do you think the construction accident have any problems peculiar to foreign workforce? If Yes, please tick (✓) the applicable items as below.

Q4: 建設事故について、外国人労働者特有の問題はあると思いますか? はいの場合、以下の該当する項目に○をつけてください。

Insufficient of construction safety awareness 工事安全意識の不足	
Communication problem due to different language 言語の違いによるコミュニケーションの問題	
Insufficient understanding towards safety site rules セーフティサイトルールの理解不足	
Safety cultural differences 安全文化の違い	
Others その他	

Please tick (✓) the relevance.
該当するボックスにチェックを入れてください(✓)

Comments:

コメント:

Q5: Which safety activities that particularly effective in preventing accidents on sites, especially for the foreign workers?

Q5: 特に外国人労働者の現場での事故防止に効果的な安全活動は?

N o.	該当するボックスにチェックを入れてください(✓) Please tick (✓) the relevance	Ranking ランキング
1	Education for new workers (at the time of employment) () 新入社員教育 (入社時) ()	
2	Safety education before assign to construction sites () 建設現場配属前の安全教育	
3	Education when changing works / tasks () 勤務・業務変更時の教育	
4	Foreman education () 職長教育	
5	Special education stipulated by law () 法定特別教育	
6	Information sharing (case studies and discussion) () 情報の共有(ケーススタディとディスカッション)	
7	Correct work procedures () 正しい作業手順	

Appendix B: Interview Questions (Continued)

Interview with xxxxxxxx Oct 2022 – Oct 2023

8	Tool Box Meeting () ツールボックスミーティング	
9	Dangerous materials and machinery education () 危険物・機械教育	
10	Safe usage of tools and machinery () 工具や機械の安全な使用	
11	Communication skills between co-workers () 同僚間のコミュニケーションスキル	
12	Education on risk recognition () リスク認識教育	
13	Education of unsafe acts () 不安全行為の教育	
14	Others () その他	

Q6: Do you think the current construction safety training on sites are effective to all workers (including foreign workers)? Why?

Q6: 現在の現場での建設安全教育は、すべての労働者（外国人労働者を含む）に効果的だと思いますか？ なんて？

Effective 効果的	
Not Effective 効果なし	

Please tick (✓) the relevance.

該当するボックスにチェックを入れてください(✓)

Reason(s):

理由:

Q7: Can foreign workers be expected as a ready to use in construction site with the current construction safety training? Why?

Q7: 現在の建設安全訓練では、外国人労働者を建設現場で即戦力として期待できますか？ なんて？

Yes はい	
No いいえ	

Please tick (✓) the relevance.

該当するボックスにチェックを入れてください(✓)

Reason(s):

理由:

Appendix B: Interview Questions (Continued)

Interview with xxxxxxxx Oct 2022 – Oct 2023

Safety Management System 安全管理体制

Q1: The difference(s) between local workers and foreign workers in terms of work attitudes, education background, culture and languages.

Q1: 現地労働者と外国人労働者の仕事に対する態度、学歴、文化、言語の違い。

No.	Characters キャラクター	Local workers 地元の労働者	Foreign workers 外国人労働者
1	Work attitude 勤務態度		
2	Safety culture 安全文化		
3	Safety knowledge 安全知識		
4	Education background 学歴		
5	Communication skills (different language for communication) コミュニケーションスキル (コミュニケーションのための異なる言語)		
6	Safety awareness 安全意識		

Others:

その他:

Q2: Any barriers to implement the safety training to the workers (including new comers, foreigners and young workers)? If yes, what are the critical barriers? Please tick (✓) according to your preference.

Q2: 労働者 (新人、外国人、若年労働者を含む) に安全教育を提供する際に障壁はありますか?

はいの場合、重要な障壁は何ですか?ご希望に応じて(✓)にチェックを入れてください。

From the perspective of construction companies:

建設会社の視点から:

Lack of technical support by consultants コンサルタントによる技術サポートの欠如 ()	Lack of awareness of OSH relevance by workers 労働者による労働安全衛生関連の認識の欠如 ()	Inadequate OSH policy 不十分な労働安全衛生方針 ()	Inadequate dedication of time 不十分な時間の献身 ()	Lack of effective communication 効果的なコミュニケーションの欠如 ()	Prioritization of production over safety 安全より生産優先 ()	Lack of budget allocation for OSH programme 労働安全衛生プログラムへの予算配分の欠如 ()
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Appendix B: Interview Questions (Continued)

Interview with xxxxxxxx Oct 2022 – Oct 2023

Others (please specify): その他には、指定してください

Comments: コメント

Q3: Any solution to overcome the barriers stated in Q2 above?

Q3: 上記の Q2 で述べた障壁を克服するための解決策はありますか?

Response: 応答:

Q4: The factors contribute to construction accidents:

Q4: 建設事故の要因は次のとおりです。

(Please tick the relevance and provide ranking (1=extreme critical, 2=very critical, 3=critical, 4-6= neutral, 7=Moderate, 8=least critical, 9=extreme least critical, 10=Not at all) according to your opinion)

(関連性にチェックを入れてランキングを提供してください (1=非常に重要、2=非常に重要、3=重要、4-6=どちらでもない、7=中程度、8=最も重要でない、9=非常に重要でない、10=まったく重要ではない)あなたの意見によると)

Foreign workers: 外国人労働者:

No.	該当するボックスにチェックを入れてください(✓) please tick (✓) if relevance	Ranking ランキン グ
1	Failure to recognize safety hazards 安全性の問題を認識していない ()	
2	Attitudes towards not wearing PPE correctly PPE を正しく着用しないことに対する態度 ()	
3	Failure to follow safety procedures during operation 操作中の安全手順の不履行 ()	
4	Lack of safety knowledge and training 安全に関する知識とトレーニングの不足 ()	
5	Improper supervision and safety control 不十分な監督と安全管理 ()	
6	Irregularly assigned tasks 不規則に割り当てられたタスク ()	

Appendix B: Interview Questions (Continued)

Interview with xxxxxxxx Oct 2022 – Oct 2023

7	Dangerous required working actions during machine operation 機械の操作中に必要な危険な作業行為 ()	
8	Cluttered working environment with surrounding objects or structures 周囲の物や構造物で雑然とした作業環境 ()	
9	Poor working surface conditions 作業面の状態が悪い ()	
10	Exposure to hazardous injury sources 危険な傷害源への暴露 ()	
11	Others (please specify) その他には、指定してください	

Construction novices: 建設初心者

No.	該当するボックスにチェックを入れてください (✓) please tick (✓) if relevance	Ranking ランキ ング
1	Failure to recognize safety hazards 安全性の問題を認識していない ()	
2	Attitudes towards not wearing PPE correctly PPE を正しく着用しないことに対する態度 ()	
3	Failure to follow safety procedures during operation 操作中の安全手順の不履行 ()	
4	Lack of safety knowledge and training 安全に関する知識とトレーニングの不足 ()	
5	Improper supervision and safety control 不十分な監督と安全管理 ()	
6	Irregularly assigned tasks 不規則に割り当てられたタスク ()	
7	Dangerous required working actions during machine operation 機械の操作中に必要な危険な作業行為 ()	
8	Cluttered working environment with surrounding objects or structures 周囲の物や構造物で雑然とした作業環境 ()	
9	Poor working surface conditions 作業面の状態が悪い ()	
10	Exposure to hazardous injury sources 危険な傷害源への暴露 ()	
11	Others (please specify) その他には、指定してください	

Appendix B: Interview Questions (Continued)

Interview with xxxxxxxx Oct 2022 – Oct 2023

Local workers: 地元の労働者:

No.	該当するボックスにチェックを入れてください (✓) please tick (✓) if relevance	Ranking ランキン グ
1	Failure to recognize safety hazards 安全性の問題を認識していない ()	
2	Attitudes towards not wearing PPE correctly PPE を正しく着用しないことに対する態度 ()	
3	Failure to follow safety procedures during operation 操作中の安全手順の不履行 ()	
4	Lack of safety knowledge and training 安全に関する知識とトレーニングの不足 ()	
5	Improper supervision and safety control 不十分な監督と安全管理 ()	
6	Irregularly assigned tasks 不規則に割り当てられたタスク ()	
7	Dangerous required working actions during machine operation 機械の操作中に必要な危険な作業行為 ()	
8	Cluttered working environment with surrounding objects or structures 周囲の物や構造物で雑然とした作業環境 ()	
9	Poor working surface conditions 作業面の状態が悪い ()	
10	Exposure to hazardous injury sources 危険な傷害源への暴露 ()	
11	Others (please specify) その他には、指定してください	

Others safety issues especially towards foreign workers and construction novices on sites, please specify:
特に外国人労働者や現場での建設初心者に対するその他の安全上の問題については、具体的に記入し
てください。

Q5: Based on the above Q4, what are the critical improvement for workers especially towards foreigner,
construction novices on sites?

Q5: 上記の Q4 を踏まえて、特に外国人、建設初心者の現場で働く人にとって重要な改善点は何で
すか?

Improvement of safety and health system / law (acceptance system) 改善安全衛生体制・法律 (受付制)	
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Appendix B: Interview Questions (Continued)

Interview with xxxxxxxx Oct 2022 – Oct 2023

Improvement of language ability (Japanese) 改善言語能力 (日本)	
Improvement of construction safety skills 改善建設安全スキル	
Others その他	

Please tick (✓) the relevance.
該当するボックスにチェックを入れてください(✓)

Comments: コメント

Safety Training Programme

安全教育プログラム

Q1: Which are the safety training contents that practice on construction sites needed to be improved? Why?

Q1: 建設現場での安全教育で改善が必要な内容は? なんで?

Contents コンテンツ	In-house	Outsource
Special education 特別教育 () -Fall prevention harness (PPE) 落下防止ハーネス (PPE) -Scaffolding 丸太足場 -Slings operation 玉掛け作業		
Skill training スキルトレーニング () -Driving skill training (Construction machines /vehicles) 運転技能訓練 (建設機械・車両) -Welding 溶接 -Slings work 玉掛け作業		
Foreman education () 職長教育		
Safety and health training (when changing work) () 安全衛生教育 (転職時)		
General education 一般教育 () -Work procedures 作業手順 -Safety rules		

Appendix B: Interview Questions (Continued)

Interview with xxxxxxxx Oct 2022 – Oct 2023

安全規約 -Signs and notices 標識と通知 -Technical terms 技術用語 -Japanese culture and customs 日本の文化と習慣		
Other education stipulated by law () その他法令に定める教育		

Please tick (✓) the relevance.

該当するボックスにチェックを入れてください(✓)

Reason(s): 理由:

Q2: Based on Q1, which of the safety training contents (in-house or out-sources) are effective for foreign workers?

Q2: Q1を踏まえて、外国人労働者に有効な安全教育内容（社内・外注）はどれ？

Response: 応答:

Q3: Teaching methods for the safety training effective for foreign workers.

Q3: 外国人労働者に有効な安全教育の指導法は？

	In-house 社内	Outsources 外部委託
Lecture only 講義のみ		
Lecture and comprehension test 講義と理解度テスト		
Sharing videos / DVD ビデオ/DVD の共有		
Sharing videos / DVD and discussion ビデオ/DVD の共有とディスカッション		
Using Virtual Reality (VR) 仮想現実 (VR) の使用		
Using VR and hands on practices VR とハンズオンプラクティスの使用		
Group discussion グループディスカッション		
Others その他		

Please tick (✓) the relevance.

該当するボックスにチェックを入れてください(✓)

Appendix B: Interview Questions (Continued)

Interview with xxxxxxxx Oct 2022 – Oct 2023

Comments: コメント

Q4: Teaching materials for the safety training that effective for foreign workers.

Q4: 外国人労働者に有効な安全教育の教材は？

該当する場合はチェック (✓)	Tick (✓) if relevance	Ranking
Handout in text form (Japanese) テキスト形式の配布資料 (日本語)		
Handout in full translation of Japanese teaching materials into various languages 日本語教材を多言語に全訳した配布資料		
Videos / DVD (without text and words) ビデオ・DVD (文字・台詞なし)		
Power Point (with pictures, texts in Japanese) パワーポイント (写真あり、日本語の文章あり)		
Power Point (with pictures, texts in different languages) パワーポイント (写真、多言語のテキスト付き)		
Sharing information (verbal discussion in Japanese) 情報共有 (日本語での口頭相談)		
Sharing information (verbal discussion in different languages) 情報共有 (多言語での口頭討論)		
Others その他		

Please tick (✓) the relevance.
該当するボックスにチェックを入れてください (✓)

Comments: コメント

Q5: What do you think about the low engagement safety training materials such as lecture and videos to be useful for foreign workers? Any recommendation for future?

Q5: 外国人労働者にとって役立つ講義やビデオなどの低エンゲージメント安全教育教材についてどう思いますか？今後のおススメは？

Response: 応答:

Appendix B: Interview Questions (Continued)

Interview with xxxxxxx Oct 2022 – Oct 2023

Q6: How to check the level of understanding after the safety training among the foreign workers? Any confirmation methods of understanding among the foreign workers?

Q6: 外国人労働者の安全教育後の理解度はどのように確認すればよいですか？外国人労働者の理解確認方法は？

Response: 応答:

Q7: How to ensure the foreign workers able to perform / work safely all time after safety training?

Q7: 安全訓練の後、外国人労働者が常に安全に作業/作業できるようにするにはどうすればよいですか？

Response: 応答:

Q8: Do you think the teaching materials and methods stated in Q3 and Q4 are sufficient for foreign workers?

Q8: Q3 と Q4 に記載されている教材と方法は、外国人労働者にとって十分だと思いますか？

Response: 応答:

Prepared by Tan ZY Oct 2022

Appendix B: Interview Questions (Continued)

Interview with xxxxxxx Oct 2022 – Oct 2023

Accident Prevention Methods (on sites) 事故防止方法（現場）

Q1: How to make sure all the employees (including foreign workers) to understand the safety policy and obey it?

Q1: 全従業員（外国人労働者を含む）が安全方針を理解し、遵守するようにするにはどうすればよいですか？

Response: 応答:

Q2: What are the common accident prevention training provided to all workers (including foreign workers) all time? Such as?

Q2: 全労働者（外国人含む）に常時実施している共通の防災教育とは？そのような？

Response: 応答:

Q3: What are the safety measures on sites to prevent accident such as fall from height?

Q3: 高所からの転落事故を防ぐための現場での安全対策は？

Response: 応答:

Q4: How would you encourage workers (including foreign workers) to adopt on site safety measures such as wearing PPE correctly.

Q4: 労働者（外国人労働者を含む）に、PPE を正しく着用するなど、現場での安全対策をどのように奨励しますか？

Response: 応答:

Appendix B: Interview Questions (Continued)

Interview with xxxxxxxx Oct 2022 – Oct 2023

Q5: Any penalties or actions to be taken towards workers who disobey the rules?

Q5: 規則に従わない労働者に対して罰則や措置はありますか?

Response: 応答:

The End. Thank you.

終わり。ありがとうございました。

Appendix C: Responses from the Interviewees (Sample 1: Japan)

Interview with Expert B, Oct 2022

General questions:

Working experiences in construction industry.

Response: _____

Administration Officer of MHLW, for 35 years mainly engaged in OSH, HRD and Technical Cooperation on Labor matters.

MHLW HQ, Branch offices, Related organizations on above fields.

Present position at JICOSH since July, 2022.

Q1: General point of view towards the current safety and health in construction industry.

Response: Labor accidents are gradually increasing including fatal accidents, that is crucial due to some factors as elderly workforce, shortage of skilled workforce and increasing human factor related accidents (fall down, back pain etc.)

Q2: What trends do you think in the situation of foreign workforce in construction industry compared to the past 5 years?

Increase tendency	<input checked="" type="checkbox"/>
Remain (flat)	<input type="checkbox"/>
Decreasing tendency	<input type="checkbox"/>

Please tick (✓) the relevance.

What is (✓) your opinion towards to above situation?

Total foreign workforce increased 1,08,769 (2016) → 1,727,221 (2021)

In construction industry that is from 41.104 (2016) → 110,018 (2021) 6.4% (2.5times higher than total)

VN 57,604, PRC 13,445, PH 11,148, IDN 6,633

Construction workforce in all: 4.97 Mil. (2016) → 4.84 Mil. (2021) including local and foreign (ALL)

Main reason for this increasing trend is coming facing manpower shortage in every sector.

Q3: What do you think in the situation of construction accident compared to the past 10 years? The construction accident trend is in the situation of:

Increase tendency	<input checked="" type="checkbox"/>
Remain (flat)	<input type="checkbox"/>
Decreasing tendency	<input checked="" type="checkbox"/>

Please tick (✓) the relevance.

What is your opinion towards to above situation?

Compared to the past 10 years, decreasing however, a recent few year, increasing due to the above reasons!

Fatal accidents: 288/867 (total) 33% (fall from height, 110) Foreign workers: 10/24 (total) 41%

Injury accidents: 16,079/149,918 11% Foreign workers: 934/5715 (total) 16%

Q4: Do you think the construction accident have any problems peculiar to foreign workforce? If Yes, please tick (✓) the applicable items as below.

Insufficient of construction safety awareness	<input type="checkbox"/>
Communication problem due to different language	<input checked="" type="checkbox"/>
Insufficient understanding towards safety site rules	<input type="checkbox"/>
Safety cultural differences	<input checked="" type="checkbox"/>
Others	<input type="checkbox"/>

Please tick (✓) the relevance.

Appendix C: Responses from the Interviewees (Sample 1: Japan) (Continued)

Interview with Expert B, Oct 2022

Comments:

Not proficient in Japanese language and Japanese work practices

→ An appropriate and effective OSH education is necessary.

Q5: Which safety activities that particularly effective in preventing accidents on sites, especially for the foreign workers?

No.	Please tick (✓) the relevance	Ranking
1	Education for new workers (at the time of employment) ()	
2	Safety education before assign to construction sites (✓)	2
3	Education when changing works / tasks ()	
4	Foreman education (✓)	3
5	Special education stipulated by law ()	
6	Information sharing (case studies and discussion) ()	
7	Correct work procedures ()	
8	Tool Box Meeting ()	
9	Dangerous materials and machinery education ()	
10	Safe usage of tools and machinery ()	
11	Communication skills between co-workers (✓)	1
12	Education on risk recognition ()	
13	Education of unsafe acts (✓)	4
14	Others ()	

Q6: Do you think the current construction safety training on sites are effective to all workers (including foreign workers)? Why?

Effective	✓
Not Effective	

Please tick (✓) the relevance.

Reason(s):

No choice for foreign workers other than following measures:

1. OSH education using understandable contents for them
2. Sign/ notice/ indication calling their attention with illustrations and their languages.

Q7: Can foreign workers be expected as a ready to use in construction site with the current construction safety training? Why?

Yes	
No	✓

Please tick (✓) the relevance.

Reason(s): Besides OSH education, more and more daily mutual communication is indispensable among their boss and colleague for their recognition.

Appendix C: Responses from the Interviewees (Sample 1: Japan) (Continued)

Interview with Expert B, Oct 2022

Safety Management System

Q1: The difference(s) between local workers and foreign workers in terms of work attitudes, education background, culture and languages.

No.	Characters	Local workers	Foreign workers
1	Work attitude		
2	Safety culture	Work attitude by membership-style	Work attitude by job-style
3	Safety knowledge		Depending on their basic education
4	Education background		Depending on their basic education
5	Communication skills (different language for communication)		Great handicap
6	Safety awareness		

Others: Personally it depends on each character, work attitude, physical ability (competency) rather than local or foreign.

Q2: Any barriers to implement the safety training to the workers (including new comers, foreigners and young workers)? If yes, what are the critical barriers? Please tick (✓) according to your preference.

From the perspective of construction companies:

Lack of technical support by consultants ()	Lack of awareness of OSH relevance by workers ()	Inadequate OSH policy ()	Inadequate dedication of time (✓)	Lack of effective communication (✓)	Prioritization of production over safety (✓)	Lack of budget allocation for OSH programme (✓)
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Others (please specify): Human factors coming from each worker's mental health condition

- Background different, culture different
- Personality different

Comments:

Q3: Any solution to overcome the barriers stated in Q2 above?

Response:

To declare Safety First before anything else by Top-down with clear understandable message, under this plan to keep on Safety Work Cycle by Bottom-up voluntary activities toward PDCA Cycle (COHSHS).

Appendix C: Responses from the Interviewees (Sample 1: Japan) (Continued)

Interview with Expert B, Oct 2022

Q4: The factors contribute to construction accidents:

(Please tick the relevance and provide ranking (1=extreme critical, 2=very critical, 3=critical, 4=neutral, 7=Moderate, 8=least critical, 9=extreme least critical, 10=Not at all) according to your opinion)

Foreign workers:

No.	<i>please tick (✓) if relevance</i>	Ranking
1	Failure to recognize safety hazards ()	
2	Attitudes towards not wearing PPE correctly (✓)	4
3	Failure to follow safety procedures during operation (✓)	5
4	Lack of safety knowledge and training (✓)	1
5	Improper supervision and safety control (✓)	2
6	Irregularly assigned tasks ()	
7	Dangerous required working actions during machine operation (✓)	3
8	Cluttered working environment with surrounding objects or structures (✓)	3
9	Poor working surface conditions ()	
10	Exposure to hazardous injury sources ()	
11	Others (please specify) Human background Factors	1

Young workers:

No.	<i>please tick (✓) if relevance</i>	Ranking
1	Failure to recognize safety hazards ()	
2	Attitudes towards not wearing PPE correctly ()	
3	Failure to follow safety procedures during operation ()	
4	Lack of safety knowledge and training (✓)	1
5	Improper supervision and safety control (✓)	2
6	Irregularly assigned tasks ()	
7	Dangerous required working actions during machine operation ()	
8	Cluttered working environment with surrounding objects or structures ()	
9	Poor working surface conditions ()	
10	Exposure to hazardous injury sources ()	
11	Others (please specify) Human background Factors	1

Local workers:

No.	<i>please tick (✓) if relevance</i>	Ranking
1	Failure to recognize safety hazards ()	
2	Attitudes towards not wearing PPE correctly ()	
3	Failure to follow safety procedures during operation (✓)	2
4	Lack of safety knowledge and training ()	
5	Improper supervision and safety control ()	
6	Irregularly assigned tasks ()	
7	Dangerous required working actions during machine operation ()	
8	Cluttered working environment with surrounding objects or structures ()	
9	Poor working surface conditions ()	
10	Exposure to hazardous injury sources ()	
11	Others (please specify) Human background Factors	1

Others safety issues especially towards foreign workers and young workers on sites, please specify:

They have few chances to experience dangerous situation, so have (gave) them chance to experience risk feeling education with body and more communication skills.

Appendix C: Responses from the Interviewees (Sample 1: Japan) (Continued)

Interview with Expert B, Oct 2022

Q5: Based on the above Q4, what are the critical improvement for workers especially towards foreigner, young workers on sites?

Improvement of safety and health system / law (acceptance system)	
Improvement of language ability (Japanese)	✓
Improvement of construction safety skills	
Others	

Please tick (✓) the relevance.

Comments:

How to make up for Communication gaps are important for them to learn on-sites skills and know-how from senior workers, foreman. Senior should contact to them with ease. (contact between senior & juniors)

Safety Training Programme

Q1: Which are the safety training contents that practice on construction sites needed to be improved? Why? **No answer for Q1, from Expert B)**

Contents	In-house	Outsource
Special education () -Fall prevention harness (PPE) -Scaffolding -Slings operation		
Skill training () -Driving skill training (Construction machines /vehicles) -Welding -Slings work		
Foreman education ()		
Safety and health training (when changing work) ()		
General education () -Work procedures -Safety rules -Signs and notices -Technical terms -Japanese culture and customs		
Other education stipulated by law ()		

Please tick (✓) the relevance.

Reason(s):

Human factor: stress, unstable life (always works, accident increase, and remained high), shortage labour

Q2: Based on Q1, which of the safety training contents (in-house or out-sources) are effective for foreign workers?

Response:

Basic general education is effective for them to learn Japanese working style, habits, customs, etc.

Appendix C: Responses from the Interviewees (Sample 1: Japan) (Continued)

Interview with Expert B, Oct 2022

Q3: Teaching methods for the safety training effective for foreign workers.

	In-house	Outsources
Lecture only		
Lecture and comprehension test		
Sharing videos / DVD		
Sharing videos / DVD and discussion	✓	
Using Virtual Reality (VR)	✓	
Using VR and hands on practices	✓	
Group discussion		
Others		

Please tick (✓) the relevance.

Comments:

Q4: Teaching materials for the safety training that effective for foreign workers.

	Tick (✓) if relevance	Ranking
Handout in text form (Japanese)		
Handout in full translation of Japanese teaching materials into various languages		
Videos / DVD (without text and words)	✓	1
Power Point (with pictures, texts in Japanese)		
Power Point (with pictures, texts in different languages)	✓	2
Sharing information (verbal discussion in Japanese)	✓	3
Sharing information (verbal discussion in different languages)		
Others		

Please tick (✓) the relevance.

Comments:

Mutual repeating communication and discussion are important for them to understand why, how to do their tasks smoothly.

Q5: What do you think about the low engagement safety training materials such as lecture and videos to be useful for foreign workers? Any recommendation for future?

Response:

They took lectures and videos seriously in general. After the lectures, they were pleased to get certificates of the Safety Training, that seems to be effective for them.

Q6: How to check the level of understanding after the safety training among the foreign workers? Any confirmation methods of understanding among the foreign workers?

Response:

Test and assessment are basic tool for their understanding, moreover, daily check (observation) by foreman /site manager if they work properly and safely as On-Job Training (OJT) in line with Safety Work Cycle.

Prepared by Tan ZY Oct 2022

Appendix C: Responses from the Interviewees (Sample 1: Japan) (Continued)

Interview with Expert B, Oct 2022

Q7: How to ensure the foreign workers able to perform / work safely all time after safety training?

Response:

Daily voluntary participation to Safety Work Cycle is essential and encourage their foreman, site manager how to support and approach them generously with warm heart sometimes strict ways.

Q8: Do you think the teaching materials and methods stated in Q3 and Q4 are sufficient for foreign workers?

Response:

It is true these are necessary for them however not sure if sufficient or not, how to make full use of these by employers in their activities seem to be important.

Accident Prevention Methods (on sites)

Q1: How to make sure all the employees (including foreign workers) to understand the safety policy and obey it?

Response:

To disseminate Top-down message on Safety First Plan
Top should approach closer to them in easy way to let them say everything as they want.
Top, foreman should check frequently their condition human factors.

Q1: What are the common accident prevention training provided to all workers (including foreign workers) all time? Such as?

Response:

Continuously practicing Safety Work Cycle two pillars of SH Management, responsibility of Employer and Specified Principal Employer at work site shown as JCOSH PP are key to prevent accidents.

Q2: What are the safety measures on sites to prevent accident such as fall from height?

Response:

To prohibit dangerous scaffold such as one side one often used narrow space. (abolish the use of one bar scaffolding)
Full harness-type safety belt wearing properly thoroughly.
To reduce personal work at high levelling as much as possible, instead, to promote automation.
Not to leave alone when he or she has to work at high level (to avoid work alone).

Q3: How would you encourage workers (including foreign workers) to adopt on site safety measures such as wearing PPE correctly.

Response:

Repeating instruction to equip PPE correctly.
To make sure that who should take responsibilities on PPE maintenance properly. (Continuously)

Q4: Any penalties or actions to be taken towards workers who disobey the rules?

Response:

OSH Law points out that workers should obey employers OSH measures to secure workers. It contains penalties within 500 thousand yen to workers, however, I have never heard so far that such case occurred. Employers should take initiatives to be responsible for securing workers. (Talk to them)

The End. Thank you.

Appendix C: Responses from the Interviewees (Sample 1: Japan) (Continued)

Interview with Expert B, Oct 2022

Additional question (revised interview question)

Q5: Why the accident rate is increasing despite the safety training is provided to construction workers? What are the critical issues on the raising of construction accident? Any solutions to overcome the situation?

Response:

-Aging issue

→ Age friendly guidelines, 65 years old, assign tasks based on their body condition

-Shortage of workforce

-Try best, to avoid accident, but we cannot avoid totally.

-Maintaining the old / existing infrastructures is critical tasks and it is very high demand (developed countries' problems)

-Retrofit is also high demand in Japan.

Appendix C: Responses from the Interviewees (Sample 2: Malaysia)

Interview sheet for Malaysian Local company

Date 2023

G) Safety

General questions:

Q1: Do you think the construction accident have any problems peculiar to foreign workforce? If Yes, please tick (✓) the applicable items as below.

Insufficient of construction safety awareness	✓
Communication problem due to different language	✓
Insufficient understanding towards safety site rules	
Safety cultural differences	✓
Others	

Q2: Which safety activities that particularly effective in preventing accidents on sites, especially for the foreign workers?

No.	Please tick (✓) the relevance	Ranking
1	Education for new workers (at the time of employment) (✓)	1
2	Safety education before assign to construction sites (✓)	2
3	Education when changing works / tasks ()	
4	Foreman education ()	
5	Special education stipulated by law ()	
6	Information sharing (case studies and discussion) (✓)	6
7	Correct work procedures (✓)	3
8	Tool Box Meeting ()	
9	Dangerous materials and machinery education ()	
10	Safe usage of tools and machinery (✓)	5
11	Communication skills between co-workers ()	
12	Education on risk recognition ()	
13	Education of unsafe acts (✓)	4
14	Others ()	

Appendix C: Responses from the Interviewees (Sample 2: Malaysia) (Continued)

Interview sheet for Malaysian Local company

Date 2023

Q3: Barriers to implement the safety training to the workers (including new comers, foreigners and young workers)? If yes, what are the critical barriers? Please tick (✓) according to your preference.

From the perspective of construction companies:

Lack of technical support by consultants ()	Lack of awareness of OSH relevance by workers (✓)	Inadequate OSH policy ()	Inadequate dedication of time ()	Lack of effective communication (✓)	Prioritization of production over safety (✓)	Lack of budget allocation for OSH programme (✓)
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Q4: Based on the above Q3, what are the critical improvement for workers especially towards foreigner on sites?

Improvement of safety and health system / law (acceptance system)	(✓)
Improvement of language ability	(✓)
Improvement of construction safety skills	
Others	

Safety Training Programme Please tick (✓) the relevance.

Q1: Which is the safety training contents that practice on construction sites needed to be improved? Why?

Contents	In-house	Outsource
Special education (✓) -Fall prevention harness (PPE) -Scaffolding -Slings operation	(✓)	
Skill training () -Driving skill training (Construction machines /vehicles) -Welding -Slings work		
Foreman education ()		
Safety and health training (when changing work) ()		
General education (✓) -Work procedures -Safety rules -Signs and notices -Technical terms -Japanese culture and customs	(✓)	
Other education stipulated by law ()		

Appendix C: Responses from the Interviewees (Sample 2: Malaysia) (Continued)

Interview sheet for Malaysian Local company

Date 2023

Q2: Teaching methods for the safety training effective for foreign workers.

Lecture only	
Lecture and comprehension test	✓
Sharing videos / DVD	✓
Sharing videos / DVD and discussion	✓
Using Virtual Reality (VR)	
Using VR and hands on practices	
Group discussion	
Others	

Please tick (✓) the relevance.

Q3: Teaching materials for the safety training that effective for foreign workers.

	Tick (✓) if relevance	Ranking
Handout in text form (Japanese)		
Handout in full translation of Japanese teaching materials into various languages	✓	3
Videos / DVD (without text and words)	✓	2
Power Point (with pictures, texts in Japanese)		
Power Point (with pictures, texts in different languages)	✓	1
Sharing information (verbal discussion in Japanese)		
Sharing information (verbal discussion in different languages)	✓	4
Others		

Please tick (✓) the relevance.

Q4: How to check the level of understanding after the safety training among the foreign workers? Any confirmation methods of understanding among the foreign workers?

Response:

CONDUCT PHYSICAL TEST ON SITE

Appendix C: Responses from the Interviewees (Sample 2: Malaysia) (Continued)

Interview sheet for Malaysian Local company

Date 2023

Q5: How to make sure all the employees (including foreign workers) to understand the safety policy and obey it? Any penalties or actions to be taken towards workers who disobey the rules?

Response:

IMPLEMENT PENALTY SYSTEM

Thank you for your cooperation!

* We would appreciate it if you could make copies of the construction system, material procurement sources, contract-related documents, etc.

* The contents of your response will be used only for the research purpose and will not be announced in a form that identifies your company.

* The contents of the survey will be utilized at academic conferences, etc., instruct us if there are any matters that should not be disclosed.

