

Analysis of Fatal Building Construction Accidents: Cases and Causes

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Abstract—Inclusive in the engineering factors of growth of the economy of any country is the construction industry, of which Malaysia as a nation is not left out. In spite of its significant contribution, the industry is known to be an accident-prone consequent upon the dangerous activities taking place at the construction stage. However, occupational accidents of diverse categories do take place on the construction sites resulting in fatal and non-fatal injuries. This study was embarked upon by giving consideration to thirty fatal cases of accident that occurred in Malaysia during a period of fourteen months (September, 2015–October, 2016), with the reports extracted from the database of Department of Safety and Health (DOSH) in Malaysia. The research was aimed at discovering the types (categories) of fatal accident on the construction sites, with attention also given to the causes of the accidents. In achieving this, thirty cases were descriptively analysed, and availing a revelation of falls from height as the leading category of accident, and electrocution as the second, while the causative factors were discovered to be lack of compliance of workers to safe work procedures and nonchalant attitude towards harnessing themselves with personal protective equipment (PPE). Consequent upon the discovery through analysis, and an effort to avert subsequent accidents in order to save lives of construction workers it is recommended that the management should enforce the compliance of workers to safe work procedures and the compulsory use of PPE during operations, while the DOSH should embark on warding round the construction sites for inspection and giving a sanction to contractors failing to enforce compliance with safety regulations.

Keywords— Construction Industry, Accident, Construction Site, Injuries, Safety

I. INTRODUCTION

The economy of Malaysia is a rapidly growing one, known to be a developing country. Thirteen states make up the country on the Peninsular Malaysia, but Sabah and Sarawak located on the Island of Borneo, with the whole nation having a land mass totalling 326,847 sq. km (1). According to the authors, Malaysia has shifted her base from being a predominant agriculture and mining country in the 1970s to an industrial-inclined nation in 1980s. This move has magnetised foreign investment to this ever-growing and developing country, and such investment benefitting many heavy industries, construction industry inclusive. In a simple term, the description of construction industry is given, according to (2), to be a sector which is made up of the clients (employers), professionals, contractors, sub-contractors, producers and suppliers of construction products and materials, providers and installers, and other organisations that are relevant to the design, build, operation and refurbishment of buildings. (3) equally describe the industry as the hub of economic and social development of all countries in the world. Furthermore, it is a vital and significant sector of the economy of Malaysia, and plays a magnificent role in the improvement of her economic growth (4). However, as indispensable the industry is, (5) report that the construction industry of Malaysia is embattled with a plethora of challenges, *inter alia* low quality and productivity, fragmentation, poor image, bureaucratic delays, lack of ethics, shortage of skilled personnel, and unavailability of data. Besides, concentration of efforts has been on cost, time, and quality with little or no regards to safety on the construction site. The authors further explain that greater number of contractors have placed emphasis on profit maximization at the expense of the establishment of comprehensive accident prevention policies, as construction sites are littered with occurrences of accident. Furthermore, Malaysian construction sites are characterised with high rate of mishaps, high risk

jobs with low wages, untrained personnel, unpalatable work environment, high labour turnover, safety deficiency, poor site management, low usage of technology, and dearth of safety information (5). Nevertheless, construction is widely regarded as an accident-prone sector which consists of copious hazards and dangers having the potential of producing hundreds of injuries and deaths (6, 7, 8). It is a profession characterised with hazards, where accidents occur because of the tasks performed and nature of the activities on construction sites (9), while this made (10) to describe the industry as being a unique one. These occurrences prompted (11) to declare that accidents that are not unpredictable, having the potential of putting construction workers' lives at risk, do take place at any time during the construction period. The author further says that poor safety management and the failure to control risk during the construction activities may lead to accidents or injuries among the construction workers. Consequent upon this, (12) give reasons for the risks involved in construction to be: nature of the construction work operations; construction methods; the physical environment of the work; construction materials; heavy equipment used and physical properties of the construction project itself. (13) posts that; construction industry has always been a critical issue, as it is considered among the most hazardous sectors when it comes to occupational accidents. According to (14), the accident figures of construction industry have remained consistently high, whereas that of the other industrial sectors have steadily declined. (15) reports that the Bureau of Labor Statistics' preliminary report reveals that of all work-related fatalities in 2011, about 16% occurred in the construction industry, that is, 721 deaths occurred in the construction industry of the overall 4,609 fatal reported workplace accidents. That is a fatality rate of 8.9 per 100,000 employed in the year 2011. These numbers also make the construction industry being considered as the second most dangerous industry, followed by the transportation and warehousing industries in the United States. In respect of the foregoing, (16) report that the situation is similar in Malaysia, where the construction industry has also been considered as one of the most hazardous industry. The authors state that the official statistics by the Malaysian Ministry of Human Resources, reveals the number of mortality and disability cases involving construction workers in Malaysia to be the highest when compared to other sectors, and went further to declare that the actual number could be much higher had it been all accidents are reported. Furthermore, according to Department of Safety & Health Malaysia (DOSH) as cited in (16) saying that the average number of cases of death, non-permanent disablement and permanent disablement in the construction industry amounted to 70, 50 and 7 cases respectively between 2007 and 2012. These, respectively, made up 53, 40 and 5 % of all occupational accidents across all industries.

Additionally, it is noticed that some of these accidents are falls from height, struck-by, electrocution, drowning, trench, crane, and machine-related. Consequently, this trend indicates that additional measures must be introduced to reduce the spate of accidents and subsequently helps to improve health and safety performance, as safety is a very important and vital matter not only in construction sector but in all sectors, for instance in manufacturing (17,18), in mining (19), in agriculture (20) and in medicine (21). Provisions for health and safety should be a solid policy whether men are engaged in hospitality, construction, retail, manufacturing, education and the like.

II. REVIEW OF LITERATURE

A. Construction Accident: Towards a Definition

(22) defines an accident as an unplanned and uncontrolled event in which the action or reaction of an object, substance, personal or radiation results in personal injury or the probability thereof. Additionally, (23) give the definition of an accident as "an unexpected, unavoidable, unintentional act resulting from the interaction of host, agent, and environmental factors within situations which involve risk taking and perception of danger". In the theory of accident causation propounded by the (22), an accident is the fourth domino in the sequence of events, as shown in figure 1 below. Also, the figure depicts the events leading to mishaps, in that social environment and ancestry lead to the fault of worker and such fault produces an unsafe act which leads to an accident, while injury is seen to be the resultant effect of accident.

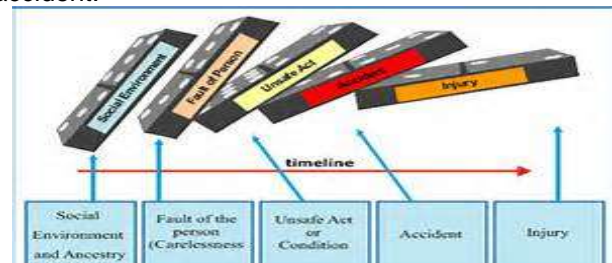


Figure 1: Heinrich Domino Theory of Accident

Accident, as defined by (24) and (25), is an undesired circumstance which results in ill health or injury, damage to plant, property, products or the environment, or a loss of business opportunity. It is a condition or circumstance where a worker or operative is injured at the course of operation, or material or equipment is damaged. Accidents happen to site workers without their intention, nor any preparation for it. It is a dangerous occurrence that impedes the smooth running of activities on site. Moreover, other scholars like (26) explain accident to be any unplanned event that results in injury or ill-health of people, or damage or loss to property, plant, materials or the environment or a loss of a business opportunity. The authors affirm that accidents are associated with adverse health and safety (H&S) outcomes having a negative financial implication on the construction

industry. Certainly, accident prevention is necessary because of these adverse H&S outcomes. Though, the prevention of accident demands the knowledge of accident causal factors, that is, how these factors contribute to causation of accident and the extent of their contribution (27), just as (28) equally lay emphasis on the fact that the first step in preventing an accident is the determination of the risk factors that are responsible for the accident. Additionally, (29) post that accidents don't just happen, they are caused by unsafe acts, unsafe conditions or both, of which most accidents result from a combination of contributing causes and one or more unsafe acts and unsafe condition. Equally, (8) describe construction accident to be a sudden and unanticipated occurrence that interrupts planned activities. However, accidents don't just happen by chance, they happen by choice. And when it happens, it lasts long to wipe off the memory. Taking a shortcut by operatives on site can lead to accident, but if a near -miss is reported, an accident can be avoided.

B. Construction Site Accidents: The Categories

Accidents do mostly occur on site, though some of the accident causation or prevention models have failed to mention the types of accident on building site, whereas it is imperative to unveil the various types of accident occurring on building sites. Building site accidents range from fall-related accidents (38), fire outbreak (30), explosion (31), electrocution/electrical incidents (32), vehicle accidents (14), roof construction falls (33), fall of heavy objects during lifting, and contact with electric current (34) etc. Additionally, reasonable number of scholars (8,14,31,32,33,34,35), have identified different types of accident on construction sites among many others to be: falls from roof, scaffold, stairs, ladder, ramp, and elevator shaft; crane accident; struck by moving vehicle, struck by an operating machine or defective machines (boilers, bulldozers, backholes), runaway by operating equipment; equipment/tools-related accident; slips and trips; electrocutions/electricity; and explosions (fire, chemical, gas, exploding compressor). However, (56) identifies fifteen types of construction accident according to Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) to include falls from height, slips, trips or falls on same level, trapped by something collapsing/overturning, contact with moving machinery, struck by moving, flying/falling object, struck by moving vehicle, strike against something fixed or stationary, contact with electricity or electrical discharge, injured while handling, lifting or carrying, drowning or asphyxiation, exposure to, or contact with a harmful substance, exposure to fire, exposure to an explosion, injured by an animal, and act of violence. Furthermore, there might have been some other injuries that occur to workers on site as a result of natural disasters, for example tornadoes. This prompted (36) to develop a cost benefit model for the construction of tornado shelters, with the belief that

shelters play a significant role in tornado mitigation efforts.

C. Building Construction Site Accidents: The Causes

Accident causation process is complex (27). Most accidents are caused by "human error" rather than unsafe mechanical or physical conditions (37). (29) and (39) categorise causes of accident under human factors, personal factors, physical factors, machinery factors and environmental factors. To (5), unsafe equipment, job site conditions, unique nature of industry, unsafe method, and human elements are responsible for accidents on building construction sites. Besides, (40) corroborates with (41) to maintain that human, technical and environmental factors are the causes of accident on building sites. Howbeit, (41) describes human factor to be drunkenness of workers, tiredness, human impairment, while technical factor as bad building designs, inadequate designs, poor quality building materials, misinterpretations of working plan and detail drawings, incompetent worker-force for implementation of project, and environmental factor to be poor weather condition and working generally in unsafe environment. Equally, (15) posts that human and environmental factors are causal roots of accident, with numerous occurrences under each factor. However, many scholars (42,43,44) have stressed out the factors responsible for accident on site to be lack of protection in material carrying and storage, lack of teamwork, lack of attention from leaders, lack of training, inexperienced managers, lack of technique guide, non-use of personal protective equipment, carelessness and negligence. Other identified causes are failure to follow safety rules, improper use of safety items, reckless action, poor safety conscientiousness of managers, non-certified skill labour, poor equipment, poor equipment maintenance, non-rigorous enforcement of safety regulations, non-definite organization commitment, non-effective operation on safety regulation, poor education of labourers, poor safety conscientiousness of labourers, non-strict operation procedures, non-perfect of safety regulations, overtime work for labour, shortage of safety management and poor information flow. An inexhaustible list avails for factors responsible for the occurrence of accident on building sites as the nature of each site differs from one to the other. Furthermore, (27), who studied 500 accident records provided by the UK Health and Safety Executive, describe the constraints and responses experienced by the parties involved in project conception, design and construction, and conclude inappropriate construction planning, inappropriate construction control, inappropriate construction operation, inappropriate site condition, and inappropriate operative action as the accident causations. The authors invariably developed an accident causation model for the construction industry, following the fact that accident causation models attempt to understand the factors and processes involved in accidents in order to develop

TABLE 1: CATEGORIES, CASES AND CAUSES OF REPORTED FATAL ACCIDENT IN MALAYSIA BETWEEN SEPTEMBER, 2015 AND OCTOBER, 2016

No	Accident Category	Summary of case	Cause	Location	Date
1	Struck by falling hook block	Due to a breakage of the wire rope of a tower crane causing the hook block to fall and strike the victim	Breakage of wire rope	Kuala Lumpur,	15 th Oct, 2016
2	Falling from height	The victim fell while walking on wooden planks heading towards the adjacent scaffold	No safe work procedure	Penang	16 th Sept, 2016
3	Electrocution	The victim was electrocuted as a lorry loader boom exposed to live wires	No safe work procedure	Sarawak	29 th June, 2016
4	Drowning	2 victims died as they played inside the construction site. They fell into the pad footing containing water	Failure to provide warning sign	Pahang	24 th June, 2016
5	Falling from height	The victim fell from the 11th floor as he was performing air-conditioner installation	Failure to wear safety harness while working at height	Johor	10 th June, 2016
6	Electrocution	Victim suffered from electrocution as he was in contact with the mixer lorry's body. The lorry turned into conductor as its body touched the power lines	Nil	Sarawak	27 th May, 2016
7	Trench accident	Victim was buried due to a landslide as he was installing formwork boards on the trench wall	1) No safe operating procedure for working inside the trench 2) Failure to conduct HIRARC	Sarawak	27 th May, 2016
8	Falling from height	Victim died due to falling from height at a height of 33 feet. He was working on the mobile scaffold during the time	The victim was not wearing any PPE equipment	Kuala Lumpur,	17 th May, 2016
9	Falling from height	Victim, work as wireman died after falling from 20th floor. Prior to the incident, he was performing installation of TV cable	Nil	Pulau Pinang	29 th March, 2016
10	Falling from height	The victim fell from 12th floor to 6th floor as he was carrying plastering job on the walls	1) No safe work procedure 2) No supervision from the employer 3) Life line was not provided to the workers while working at height	Pahang	25 th March, 2016
11	Falling from height	The victim fell from the 6th floor while carrying out the work of binding the cable at the edge of the floor of the building	The open edges were not covered	Johor	3 rd March, 2016
12	Falling from height	Victim, a civilian, is believed to have fallen from a height approximately 5 meters	The open edges were not covered	Johor	29 th Feb, 2016
13	Falling from height	Victim fell down at the height of approximately 20 meters. This incident occurred due to open edges	There are weaknesses in construction site management particularly the access to the work site	Johor	22 nd Feb, 2016
14	Falling from height	The victim was working on the roof at a height of 7.7 meters. The victim fell as he stepped on broken roofs. The victim died in hospital	No safe work procedure in relation to working at height	Sarawak	11 th Jan, 2016
15	Trench excavation	The victim worked as a detector to find any utilities, electric cables or hazardous materials in the soil. During the landslides incident, the victim was working in the hole. He was buried to the chest	Nil	Pulau Pinang	11 th Jan, 2016
16	Falling from height	The victim fell as he was walking through the opening between the wooden boards. He fell from 6th to the 1st floor	1) Lack of supervision from the employer 2) Floor opening	Johor	18 th Dec, 2015
17	Electrocution	Victim died due to electrocution as he was fixing the socket without turning off the generator set	Unsafe act	Sarawak	10 th Dec, 2015
18	Drowning	The incident took place as victim was repairing the leaking water pipe in the reservoir. He was drowned due to water that rapidly increased	Nil	Sabah	28 th Nov, 2015
19	Falling from	Pipe came off and hit the victim as he was doing	No safe work procedure	Pahang	15 th Nov,

	height	the cleaning work. As a result, he fell 19 meters down			2016
20	Falling from height	The victim slipped and fell at the height of 7 meters while doing the work. During the incident, he was performing his duties as window cleaner.	There were signs of a break in the lanyards	Pulau Pinang	07 th Nov, 2015
21	Struck by tower crane bucket	Incident happened as the 1.2 tonne bucket filled with sand was lifted by tower crane. During the process, suddenly bucket fell down and struck the victim under	Failure to hoisting system	WPKL	26 th Oct, 2016
22	Falling from height	The victim fell while working alone on the 14th floor. He was cleaning the wall during the incident	1)No supervision by employer 2)Did not wear safety harness	Pulau Pinang	17 th Oct, 2016
23	Falling from height	The victim worked as a Signaller. The victim fell while he was working. There were no witnesses that saw the incident	Nil	Sarawak	
24	Crushed by crane boom	The incident occurred as the lifting works underway. Suddenly, crane boom fell down and hit the crane's operator cabin	Swing lock pin was loosen causing the crane boom to fall down	Pulau Pinang	3 rd oct, 2015
25	Struck by support formwork	The incident took place as the dismantling support formwork job is underway. Six workers including victim were assigned for that task.	Fail to comply with safe operating procedure		01 st Oct, 2015
26	Caught between two machines	During the incident, victim tried to move the forklift using lorry loader. Unfortunately, he was caught between forklift and lorry due to strong pull from the lorry loader's boom	Nil	Sarawak	30 th Sept, 2015
27	Falling from height	Victim was found dead on top of the car top passenger hoist. He is believed to have fallen from 20th floor. From the interview, victim was not working there and he went into the site looking at the job or meeting friend	Nil	Sarawak	28 th Sept, 2015
28	Falling from height	Victim died of falling from the height of 64 meters. During the incident, he was on the way down to lower floor by taking shortcut. He used scaffold instead of stairs provided.	Unsafe act	Johor	19 th Sept, 2015
29	Falling from height	Prior to the incident, victim was doing work of installing plywood on the 2nd floor. He is believed to fall from a height of approximately 6 meters	1) Unsafe working condition 2)Inadequate supply of PPE to the workers	Pulau Pinang	14 th Sept, 2015
30	Struck by falling brickwork	Victim, a student, died due to being hit by falling brickwork that was still under construction	Nil	Sekolah, Kelantan	07 th Sept, 2015

Source: Adapted from (57)

TABLE 7: TYPES OF ACCIDENTS COMPARED WITH THE CAUSES OF ACCIDENT

		Lack of non-compliance with safe work procedure	Lack of PPE/shortage in provision	Lack of edge protection	Lack of supervision	Material failure	Unsafe act of worker	Failure in hazard identification	No warning sign	Floor opening not covered	Equipment failure	Unsafe working condition	Missing causes	Total
1	Falls from height	4(2 nd) 18.2%	5(1 st) 22.7%	3(3 rd) 13.6%	3(3 rd) 13.6%	1(5 th) 4.5%	1(5 th) 4.5%	-	-	1(5 th) 4.5%	-	1(5 th) 4.5%	3 13.6%	22
2	Struck-by	2 50.0%	-	-	-	1 25.0%	-	-	-	-	-	-	1 25.0%	4
3	Electrocution	1 33.3%	-	-	-	-	1 33.3%	-	-	-	-	-	1 33.3%	3
4	Drowning	-	-	-	-	-	-	1 33.3%	1 33.3%	-	-	-	1 33.3%	3
5	Trench	1 50%	-	-	-	-	-	-	-	-	-	-	1 50%	2
6	Crane	-	-	-	-	-	-	-	-	-	1 100%	-	-	1
7	Machine-related	-	-	-	-	-	-	-	-	-	-	-	1 100%	1
	TOTAL	8	5	3	3	2	2	1	1	1	1	1	8	36

strategies for accident prevention. Equally, accident causation models, according to (45), put up an attempt in understanding those factors and processes incorporated in accidents so as to come out with workable and proven methods in the elimination of accident. Hence, (16) report that it is predicted that future accident causation and prevention models will become more complicated to keep up with the increase in the usage of high technology tools on site, types of construction procurement and height of building. In addition, (46) classifies unsafe acts and conditions as the primary cause of accident, while management system pressures and social pressures are described as the secondary cause.

D. Construction Accident: The Cases

Evidences avail in most places on the occurrence of accidents on building construction sites. It is neither a fiction nor an abstract referring to accident cases. Nevertheless, unveiling the whole cases of accident cannot be possible in a single journal article. Some of these cases are published on-line, some appearing in literature, while some are obtainable at the offices of any of the organisations that are regulating occupational health and safety of construction site workers. The above listed cases in Table 1 are a tip of the icebergs of accident cases occurring on construction sites in Malaysia. The cases are fatal, taken from the months of September, 2015 to October, 2016 as contained in the database of the Department of Occupational Safety and Health (DOSH), Malaysia.

III RESEARCH METHODOLOGY

The research methodology consists of review of literature to identify the different types of accident on building construction sites at a global level, as well as the various factors responsible for the accidents, coupled with descriptive analysis of thirty cases of fatal accident occurring in construction sites of Malaysia within a period of fourteen months (September, 2015 and October, 2016). The frequency of each reported accident and the causes were considered. The months of occurrence, as well as the locations of the accident was analysed in order to find out the month and State with highest frequency. Additionally, analysis was made to determine the State characterised with the most frequent accident. Comparison of the types of accidents with the location of occurrence was made to establish the peculiarities of accident occurring in the affected State of Malaysia. Moreover, an effort was made to confirm the frequency of the causes of accident in relation to each type of accident.

IV ANALYSIS AND DISCUSSION

A. Cases of accident

Table 1 above shows the general description of the construction accidents that occurred, reported and recorded by the DOSH in Malaysia. The occurred cases were reportedly published with the types, causes, locations (states), periods (months), and the consequential effects of the accidents. They were all fatal accidents leading to deaths of the operatives. However, a period of fourteen months was covered in the extracted report and contains seven States of Malaysia where the accidents occurred. Consideration must be given to the fact that seven out of the thirteen States in Malaysia were involved in the period of coverage (14months).

B. Analysis of Frequency of Types of Accident.

TABLE 2. FREQUENCY OF TYPES OF ACCIDENT

SN	Types of Accident	Cases	Percentage	Rank
1	Falls from height	17	56.67	1 st
2	Struck-by	4	13.33	2 nd
3	Electrocution	3	10.00	3 rd
4	Drowning	2	6.67	4 th
5	Trench	2	6.67	4 th
6	Crane	1	3.33	6 th
7	Machine-related	1	3.33	6 th
	TOTAL	30	100.00	

Table 2 shows the analysis of the different categories of accident occurring in Malaysia as contained in DOSH database. Cases reported were falls from height, struck-by, electrocution, drowning, machine-related, crane, and trench accident. It is evident in the analysis that falls from height occurred mostly within the affected seven states and for the period of fourteen months under consideration, having a percentage of 57%. This is in agreement with previous studies that falls from height are found to be the leading cause of injuries to workers and deaths of operatives in the construction industry (47,48). A plethora of reasons can be given for the high frequency of falls which among other things is the passion for the construction of high-rise buildings making the workers to work at a very high platform and resulting to fall. Moreover, struck-by accident followed in the order of frequency amounting to 13% of the accidents happening within the understudied period of fourteen months. Besides, electrocution accident occurred in three different occasions ranking 3rd and having a percentage of 10%. However, other accidents that occurred were not as frequent as the first three previously mentioned ones, and such accidents include drowning (7%), trench accident (7%), crane accident (3%), and machine-related accident (3%).

C. Analysis of Frequency of the Causes of Accident

TABLE 3: FREQUENCY OF THE CAUSES OF ACCIDENT

SN	Accident Causes	F	%	Rank
1	Lack of or non-compliance with safe work procedure	8	22.22	1 st
2	Lack of or shortage of PPE	5	13.89	2 nd
3	Lack of edge protection	3	8.33	3 rd
4	Lack of supervision	3	8.33	3 rd
5	Material failure	2	5.56	5 th
6	Unsafe act of worker	2	5.56	5 th
7	No hazard identification	1	2.78	7 th
8	No warning sign	1	2.78	7 th
9	Floor opening not covered	1	2.78	7 th
10	Equipment failure	1	2.78	7 th
11	Unsafe working condition	1	2.78	7 th
12	Missing causes	8	22.22	
TOTAL		36	100.00	

Table 3 is a composition of the causes of the accidents, with the inclusion of the rate of occurrence (frequency). Most accidents are caused as a result of lack of safe work procedure or non-compliance with safe work procedure, as it is being ranked first in frequency (22%). Other most frequently causes of accident are non-usage of personal protective equipment (PPE) or shortage of provision of it (14%), absence of edge protection (8%), lack of supervision (8%), material failure (6%), and unsafe act of worker (6%). It is important to stress out the fact that inability of the construction workers on site to comply with the safe work procedure has been responsible for the fatal accidents that do happen to them during progress of work. Many of the workers engage in shortcuts at the detriment of their safety. Furthermore, the non-usage of PPE has exposed the workers to unnecessary hazards with an attendant impact on their safety. Nevertheless, research has revealed that most of the workers jettison the usage of PPE on the basis that it gives them a little discomfort, while (49) opines that the frequent rejections of personal protective equipment (PPE) lead to an increased injury risk for workers, while he explains the reason of not using it to be the difficulty created for the workers in meeting piece-rates. Moreover, the essence of supervision of work is significant in any construction work, as it can be seen that supervision deficiency accounted for 8% of the causes of accident, ranking 3rd. In addition to the foregoing are the effects of absence of edge protection in respect to safety of workers as well as usage of poor materials. Lack of edge protection led to the accident that resulted in a fall in tripartite occasions, as shown in the analysis.

D. Analysis of Period of Occurrence of Accident

TABLE 4: PERIOD OF OCCURRENCE OF ACCIDENT

SN	Month	F	%	Rank
1	January	2	6.67	7 th
2	February	2	6.67	7 th
3	March	3	10.00	3 rd
4	April	=	=	=
5	May	3	10.00	3 rd
6	June	3	10.00	3 rd
7	July	=	=	=
8	August	=	=	=
9	September	6	20.00	1 st
10	October	5	16.67	2 nd
11	November	3	10.00	3 rd
12	December	2	6.67	7 th
	Missing Month	1	3.33	
TOTAL		30	100.0	

Table 4 incorporates the frequency of accident in relation to the months of the year. The months of September and October recorded the highest accident rates with 20% and 17% respectively. No records of accident in April, July and August. Nevertheless, since accident takes place fortuitously (22), one cannot specifically state the reasons behind the skewed occurrence of the accidents within the period of fourteen months. Categorically, it can be declared that no specific month in any year that the occurrence of accident is dear. Moreover, taking a clue from the research of (5) stating that Malaysia construction site is embattled with unavailability of data (a challenge indeed), it may be that those months without any records are months fulfilling the submission of (5).

E Analysis of Location of Accident

TABLE 5: LOCATION OF ACCIDENT

SN	State	F	%	Rank
1	Sarawak	8	26.67	1 st
2	Pulau Pinang	7	23.33	2 nd
3	Johor	6	20.00	3 rd
4	Kuala Lumpur	3	10.00	4 th
5	Pahang	3	10.00	4 th
6	Sabah	1	3.33	6 th
7	Kelantan	1	3.33	6 th
	Missing data	1	3.33	
		30	100.00	

Table 5 shows the frequency of accident in relation to the States of Malaysia. Among the thirteen states only seven states recorded the occurrence of site accidents, Sarawak is characterised with the most frequent accidents (27%), Pulau Pinang coming 2nd in ranking (23%), and Johor being the 3rd with 20%. The other four States are Kuala Lumpur (10%), Pahang (10%), Sabah (3%), and Kelantan (3%) experiencing low level of accident occurrence. The remaining States whose reports are not inclusive may be as a result of the few months considered for this report, or that the contractors executing projects in those States

are not complying with the regulations governing reporting of accidents, as low response to reporting of accident is a common syndrome in most countries, particularly the underdeveloped and developing countries (50), while the fear of losing the image of the firm makes some contracting organisations fail to report any mishap (51), as well as the characteristics of contractors having little or no passion for safety (44). Finally, one cannot frankly say that those States without any reports are completely free of mishaps, neither can we say there are no construction works going on there.

E. Comparison of Types of Accidents with the Location of Occurrence

TABLE 6: TYPES OF ACCIDENTS COMPARED WITH THE LOCATION OF OCCURRENCE

SN	Types of accident	Sarawak	Pulau Pinang	Johor	Kuala Lumpur	Pahang	Sabah	Kelantan	Missing data
1	Falls from height	3	5	6	1	2	-	-	-
2	Struck-by	-	-	-	2	-	-	1	1
3	Electrocution	3	-	-	-	-	-	-	-
4	Drowning	-	-	-	-	1	1	-	-
5	Trench	1	1	-	-	-	-	-	-
6	Crane	-	1	-	-	-	-	-	-
7	Machine-related	1	-	-	-	-	-	-	-
	TOTAL	8	7	6	3	3	1	1	1

Furthermore, as regards the peculiarities of accident taking place in each State, a comparison was made as shown in Table 6 above. It is seen that falls from height are very rampant in Johor, followed by Pulau Pinang, and also in Sarawak ranking 1st, 2nd, and 3rd respectively. In Sarawak also, occurrence of electrocution is prominent, as it can be seen that all the electrical accidents that took place within the period under consideration happened in Sarawak. DOSH needs to investigate what has actually been happening with the manner workers handle activities involving electricity in Sarawak. No other accident, apart from electrocution, happened in Sarawak. Additionally, struck-by accident took place only in Kuala Lumpur twice, and once in Kelantan. Other states did not experience any electrical hazards. Other accidents are not so frequent in occurrence, believably there are once in a blue moon. That is, accidents like drowning (though not peculiar with building construction), trench, crane and machine-related. Drowning took place only in Pahang and Sabah, once in each State, while accidents happening in trench affected only Sarawak and Pulau Pinang, once in each state also.

G Comparison of Types of Accidents with the Causes

Table 7 above reveals the causes associated with each type of accident, together with their level of occurrences. For the most prominent accident (falls from height), the non-usage of the personal protective equipment (PPE) was the cause of the ever occurred falls, being ranked first with 23% of the causes of accident associated with falls. The fall that took place in Sarawak was as a result of non-provision of life line to the worker that fell and died. Many other researchers have attested to the fact that failure in the usage of PPE (18,27,52) has been a major reason for the severity of fall accidents. The second in ranking was the lack of or non-compliance with safe work procedure, which was also the cause of the struck-by and electrocution accidents that took place. The safety regulations are available for the workers to comply with for the sake of their safety, but the pomposity and insubordination of construction workers prevent them from complying, and always wanting to have their own ways of carrying out activities on site. For instance, taking shortcuts (53,54), drug addiction (55) and speedy operation. Moreover, lack of edge protection and lack of thorough supervision were equally ranked high as causes of fall-related accidents. The importance of edge protection cannot be overemphasized in the prevention of falls among operatives, particularly those operating at a high platform, as Malaysia is known to be engulfed with the construction of high-rise buildings in recent time in meeting up with the world class.

V. CONCLUSION

A fractional part of fatal cases of accident is made available, with emphasis on construction sites in Malaysia, as published by DOSH (2016). Thirty fatal cases of accident covering a period of fourteen months have been considered. The accident types, summary of cases, causes, locations and dates were presented. Falls were found out to be the most frequent accident, while the factors mostly responsible for the accident have been found out to be lack of or non-compliance with safe work procedures, and the non-usage of PPE. The two causes were mostly responsible for fall-related accidents and electrocution. Based on the fact that the cost of accident is high, it is recommended that strict adherence to the safety regulations should be enforced by the management of construction site. Besides, the culture of the use of PPE and sufficient provision should be imbibed. It is recommended that the DOSH agency should ward round the site of operations to enforce compliance to safety rules, while the contractors found deficient of this should be fined, as accidents do not only have effect on the worker but on some other personalities, contractor inclusive.

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