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**A STUDY ON WORKPLACE HAZARDS AMONG BUILDING MAINTENANCE
PERSONALS**

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POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

**A STUDY ON WORKPLACE HAZARDS AMONG BUILDING
MAINTENANCE PERSONALS**

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ABSTRAK

Pengurusan fasiliti adalah profesion yang akan mengembang dan memberikan sokongan penting untuk aktiviti perniagaan untuk industri dan menggabungkan beberapa aktiviti yang menghubungkan orang, proses, tempat, mesin, teknologi untuk melakukan aktiviti penyelenggaraan untuk menyokong perniagaan teras syarikat atau organisasi. Terdapat bahaya yang tidak dijangka yang boleh berlaku dalam aktiviti penyelenggaraan. Untuk tujuan itu, pengkajian adalah penting untuk mengetahui jenis bahaya di tempat kerja dan juga yang terdapat dalam aktiviti penyelenggaraan. Tujuan penyelidikan ini adalah untuk mengesyorkan strategi yang paling sesuai untuk mengatasi bahaya di tempat kerja yang terdapat di kalangan pekerja penyelenggaraan bangunan. Kajian penyelidikan ini menggunakan kaedah campuran dalam bentuk pendekatan kuantitatif dan disokong dengan pendekatan kualitatif. Instrumen yang digunakan dalam kajian ini adalah soal selidik dan temubual separa berstruktur bagi pengumpulan data. Soal selidik telah diedarkan kepada 70 orang tetapi hanya 61 responden yang menjawab soal selidik tersebut. Oleh itu, 60 responden yang terlibat dalam penyelidikan mewakili tiga organisasi yang berbeza. Soal selidik dianalisis menggunakan pakej Perisian SPSS dan mencapai kadar respons 87.1%. Berdasarkan penemuan tersebut, pemantauan berterusan seperti memerhatikan tingkah laku, alat dan peralatan pekerja dan juga persekitarannya melalui pemeriksaan berjadual, pengauditan pihak ketiga dan pemilihan PPE yang berkesan akan sentiasa memperbaiki dan meningkatkan keselamatan di tempat kerja. Oleh itu, pemantauan berterusan adalah strategi yang paling berkesan yang harus dilaksanakan untuk mengurangkan pendedahan terhadap bahaya. Oleh itu, sumbangan kajian ini akan menambah pengetahuan untuk menguruskan bahaya ini dengan cara yang berkesan.

ABSTRACT

Facility management is an upcoming profession and provides essential supports for business activities for an industry and it incorporates many activities which relates people, process, places, machinery, technology to perform maintenance activities to support the core business of the company or an organization. There are unforeseen hazards that are present in maintenance activities. For that purpose, it is crucial to find out the types of workplace hazards that are found in the maintenance activities. The aim of this research is to recommend the most suitable strategy to overcome the workplace hazards that are found among building maintenance personals. This research study used the mixed method in the form of quantitative approach and it is supported with qualitative approach. The instruments used in this study was questionnaire and semi-structured interviews for data collection. The questionnaire has been distributed to 70 people but only 61 respondent's responded to the questionnaire. Therefore, 60 respondents that were involved in the research representing three different organizations. The questionnaire was analyzed using the SPSS Software package and achieved 87.1% response rate. Based on the findings, continuous monitoring such as observing worker's behavior, tools and equipment and also their surrounding environment through scheduled inspection, third party auditing and effective PPE selection will constantly improvise and enhance the workplace safety. Hence, continuous monitoring is the most effective strategy that should be implemented in order to reduce the exposure towards the hazards. Therefore, the contribution of this study will add to the body of knowledge in order to manage these hazards in much effective manner.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Facility management (FM) is known to be one of the professions that is becoming increasingly important in the industry nowadays. In addition, the profession also incorporates many activities related to people, processes, places, and technology and so on. Basically, facility management are carried out to facilitate the core business of the organization and to ensure that the objectives of the organization are achieved. There are various definitions of FM found in the literature but the most common term that researchers often repeat is the integration of facilities and services, workplaces and supporting the core business of the company or an organization. (Alexander,1996) defines FM as a principle covering various elements such as real estate, space, developing a healthy environment, health and safety, support services, and requiring appropriate control points to be established within the organization. Meanwhile, (Elyna Myeda & Pitt,2014) define FM as a profession consisting of various fields and the integration of people, places, processes and technologies to achieve agreed services in ensuring the function and effectiveness of activities in a developed environment.

The definitions from above shows that there are few crucial terms that been used to narrate FM. To sum up, it can be considered that the main focus of FM is about workplace management. To ensure end users satisfaction at workplace, it is vital to make sure that the client's requirement on systems' capability to deliver goods and services that need to achieve certain quality needs. Hence, the systems must be available for the use and by which fulfill important quality specifications. Reliability and safety are two of these essential quality specifications. But the performance of the system will slowly diminish the operation, reliability and safety.

Therefore, management must determine and implement proper maintenance strategies to ensure the functioning of the systems (Coetzee,1998). To ensure the functionality of a system, maintenance is important for the system's impact on safety and for prevention of incident and accidents. (Uth,1999). There are generally two different kinds of maintenance errors: erroneously performed maintenance and lack of necessary maintenance (Reason & Hobbs,2003). Erroneously performed maintenance are mostly cause due to human error when carried out a work in a wrong manner that becomes an ingredient for failure. Lack of necessary maintenance are referred to someone fail to detect malfunctions or failure to carry out the proper maintenance task.

Even though the maintenance is carried out to in order to ensure safety, improper way of carrying out maintenance can cause incidents and accidents to happen because there are unforeseen hazards that are present in maintenance activities. It is necessary to investigate the incidents and accidents in order to learn from the past. For that purpose, it is crucial to identify the occupational hazards that are found in the maintenance activities. Both maintenance personnel and managers need to be aware of the maintenance risk and how it can be managed (Reason & Hobbs, 2003). Adequate understanding from past incidents and discovering fundamental reasons such as lack of management commitment will cause accident and incidents to happen while performing maintenance activity.

This paper can be used to as a tool to create a healthy and safe working environment. This research will able to identify a few strategies to manage and also to overcome the hazards that arise while performing maintenance activities. By doing so, it will be more effortless for the management to follow the strategies as a part of guideline when hazards arise among maintenance personnel's in the future.

1.2 PROBLEM STATEMENT

An accident is an unintended event that has disruptions or unwanted consequences which are not only associated with harm, loss and injury but it also can be very catastrophic and will give extensive impact to day to day production depending upon certain work nature or requirement. For example, in a place where complex machinery which involves two or more machines are been operated, it might be very dangerous if an accidents or incident occur. As a matter of fact, there are so many hazards that could results in various accidents and incidents to take place at the workplace.

According to (Castro et al., 2009), reported that being inadequately informed by employers about workplace hazards. The job demand of some industries reported to be hazardous to the health and safety of the workers yet the workers are poorly informed by their management. Prior to attempting an identification of the solution for workplace accident, it is important to better understand what the elements are or factors that cause workplace accident first. (Zakaria.N.H, 2012). Accidents and incidents could be occurred for many reasons hence precise understanding on why an accident happens is the first step for prevention. In order to do so, it is essential to identify the types hazards that exist while carrying out a work. But it is known to be difficult when it comes to gain properly recognize the fundamental factors.

Basically, work is an activity that involves multiple physical and mental effort that are performed in order to achieve a purpose or required results. Most studies reported higher prevalence of occupational injuries among blue-collar workers in the construction and industry sectors, whose jobs require high level of physical tasks. (Faremi et al., 2014). Among those works, maintenance works is also a crucial part of a works that demands greater level of physical tasks. Maintenance is a general term that consist varieties of tasks in every different types of sectors such as Civil, Electrical, Mechanical and including in all kinds of work environment.

Well organized maintenance is performed in order to keep the equipment's, machinery and the workplace environment safe and reliable since improper maintenance and lack of maintenance can lead to health problems, accidents and also dangerous situations. This maintenance works involves high risk activities and few of them results from the work demands as well as the nature of the works. The maintenance personnel are more likely to be prone and exposed to various hazards compared with other workers whereas maintenance operation mostly needs disassemble and reassemble of complicated and complex machineries that literally results in greater risk of incidents, accidents and near miss to occur.

The maintenance personnel are vulnerable to high risk activities with specified hazards which includes close contact with tools, equipment's, machines and works alongside of running operations. Besides that, maintenance activity requires the workers to be directly in contact machines as it cannot be reduced, after all it is opposite to normal operation. They are numerous types of hazards that are underlying in maintenance as it is often require non-routine tasks, unusual works and usually carried out in exceptional circumstances such as working at height and confined spaces. Hence, to learn from the past, it is necessary to investigate incidents and accidents (Reinach & Viale, 2006). However, it is not easy to properly investigate incidents or accidents.

So even though the risk of maintenance cannot be completely eliminated, it can be managed more effectively (Reason & Hobbs, 2003). One way to achieve this is to learn from past incidents and accidents through their investigations (Sklet, 2004). Even though accident and incident are hard to investigation, it mostly deals with technical factors and ways to overcome the hazards. John. G, (2018) stated that implementing a risk mitigation plan that addresses all types of hazards are not always feasible. Although necessary risk mitigation is implemented within maintenance related works yet it does not guarantee its effectiveness.

1.3 RESEARCH AIM

To recommend the most suitable strategy to overcome the workplace hazards that are found among building maintenance personnel's.

1.4 CENTRAL RESEARCH QUESTION

This study presents questions that can give a clear picture of the need of recognizing hazards that are found in the maintenance works. The first question that can be asked is, what are the most prevalent workplace hazards that occur during building maintenance works?

1.4.1 SECONDARY RESEARCH QUESTION

The sub -questions for this study were to answer the following research questions:

- i. What are the types of workplace hazards that exist among building maintenance personals?
- ii. To what extend are the contributing factors cause accidents to occur?
- iii. What are the strategies to manage those hazards?

1.5 RESEARCH OBJECTIVES

There are research objectives to be achieved from this study.

- i. To identify the types of workplace hazards which building maintenance personals are exposed to during their work.
- ii. To investigate the contributing factors which may cause accidents to happen when the maintenance works are being carried out.
- iii. To propose the most effective strategies which could be implemented to reduce their exposure towards the hazards.

1.6 SCOPE OF RESEARCH

This research will be carried out in three different organizations that are located in UiTM Puncak Alam which are namely BMES Maintenance Services Sdn Bhd, Puncak PKF Resources and Wawasan Landscape Resources Sdn Bhd. The physical hazards are one of the most similar and common type of hazard that exist in all work element or work activities. Therefore, physical hazards will be the main focus of this research. Questionnaire and Semi-structured interviews will be distributed to obtain the research data for this

research. Respondents of this study will consist of top level, middle level and operational or low level management bodies that includes Facility Manager, Engineer, Executives, building maintenance technician, operational or ground staffs and other qualified personnel's.

1.7 SIGNIFICANT OF RESEARCH

The outcome of this research can be a tool to create a safe and healthy working environment in the facility management industry to facilitate the requirement of OSHA 1994. This research will be able to identify the most prevalent workplace hazard that arise during building maintenance works and will be able to develop new plans and make improvements on safety and health management practices for the wellbeing of the maintenance personnel's in order to provide understanding and practice it as a part of work culture. By doing so, it will promote the right safety attitudes while performing maintenance works and enhance their knowledge, skills and increases worker's involvement.

Besides that, it will help to increase awareness and efficiency of the works as well as to preserve the safety and health of the maintenance personnel besides the building occupants. Moreover, this research will be able to improve the current and future performance of maintenance personnel by improving their ability to perform maintenance works in a safe manner and enables the organizational to achieve their objectives by reducing downtimes that are caused by incidents and accidents.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Facility management are being carried out to facilitate the core business of an organization and to ensure that the goal or objectives of the organization are achieved. It incorporates range of disciplines and services to ensure the functionality, comfort, safety and efficiency of a built environments such as building and spaces. When it comes to facilities management, there are several arrangements of different types of responsibilities that need to be attained to safety and health respectively. They are four main pillars of facilities management which includes people, process, building and technology. Supporting people by creating a serving work environment for employees that work within, establishing process to create an order to workplace that gives positive impact on way of people make use of the workplace, up keeping and make improvements on building and understand, implement and use of right technology at workplaces are the main focuses of facilities management.

When it comes to up keeping and making improvement on building involves multiple operations and maintenance activities that need to be performed in order to maintain all necessary requirements to fulfill the business needs. Safety is one of the top most concern that need to focused on whenever it involves maintenance tasks. Maintenance is an essential activity that are carried out to maintain and keep an item or building in its best operational condition and it is important to retain or restore a machine, equipment or system as per specified condition to maximize life span. It includes unscheduled repairs, inspections, planned preventive maintenance, and calibration and testing (Lind & Nenonen, 2008).

Besides that, those maintenance activity or works involves servicing, repair, modification, inspections, overhauls and condition verifications has various unforeseen hazards that exposes the maintenance personnel to be prone to numerous unsafe condition and environment that might result in accidents which might cause injury, utmost health effect and also loss of life. The maintenance related risks are endangering the safety of maintenance crew members have been much less examined, although maintenance is considered a risky operation from the viewpoint of occupational safety (Lind & Nenonen, 2008). Maintenance personnel or workers are prone to several types of hazards while carrying out the works such Biological hazards, chemical hazards, physical hazards, safety hazards, ergonomics, psychosocial hazards and so on. Physical hazards are one of the most frequent hazards that endangers and expose the maintenance personnel to higher risk of injuries since it demands high usage of manpower to carry out the works. Any work environment is capable of causing injury and also death to employees or workers. Maintenance personal are having high exposure to hazards since the work environment many vary from time to time and change according to its work demands.

According to DOSH's National Occupational Accident and Disease Main indicator report stated that the accident rate for the 15,073,400-workforce nationwide was 2.71 per 1,000 workers and the death rate, 3.83 per 100,000 workers. The report covers 10 sectors and it consist several subject that has been taken into the account that includes the workers who abide suffered permanent disability (PD), non-permanent disability (NPD) or died at the workplace. Other than that, International Policy and Research Development Division's Occupational Accident Statistic by Sectors revealed that Business services has ranked as the second highest with 6 permanent disability (PD), fourth highest with 303 non-permanent disability (NPD) and third highest with 14 deaths until November 2020.

2.2 DEFINITION OF SAFETY

Safety is a condition where hazards or a state that leads to physical, material or psychological harm that are been controlled in order to preserve the health, safety and wellbeing of an individual or a worker. Other than that, safety indicates that the chances of a person or a property to be harmed by the risks are been reduced to acceptable level and maintained at low level by continuously carrying out the process of hazards identification and effective management.

2.3 DEFINITION OF HAZARD

A hazard is referred to potential harm that causes damage or adverse health which are due to any unsafe condition or possible root of an undesirable event with potential for impairment or damage and it is closely related with the risk (Ahmad, et al., 2016). A hazard is something that are capable of causing harm if not controlled and it is a source of potential harm, damage or might cause adverse health effects on something or someone under a certain work conditions. Normally, a hazard can cause utmost health problems, harm and injury to an individual or worker who perform the work and even results in property or equipment loss to a particular organization if it is not managed precisely.

2.4 OCCUPATIONAL HAZARD

Occupational health, or simply health, is concerned with the two-way relationship between work and health and occupational health hazard has a potential to cause harm to human's health (Hassim & Edwards, 2006). The occupational hazard is something that inherent a particular occupation danger that can cause injury or accident to occur. Besides that, it is a working condition of a worker that has higher possibilities to lead towards several occupational diseases and illness or even worst might cause death to the person who carried out the work.

2.5 MAINTENANCE PERSONAL

Maintenance personal are mostly responsible to conduct or carry out routine inspections on buildings, equipment and its surrounding places such as cleaning and landscaping. Besides that, the term “maintenance crew” refers to full-time maintenance workers and the term “maintenance operations” to tasks that are performed by full-time maintenance workers in industrial workplaces (Lind & Nenonen, 2008). Other than that, they are also responsible to perform planned preventive maintenance to ensure that the buildings, machine and equipment as well as the surrounding places free from the needs of repair or up keepings. The maintenance workers cover wide range of works such as Civil works, Mechanical works, Electrical works, Cleaning Services and Landscaping works. Basically, maintenance personal or maintenance workers performs repairs, maintaining and fixing mechanical equipment, machinery and buildings. Furthermore, all those works involve plumbing works, painting works, floor up keeping and repairs, electrical repairs, checking control panels, identifying electrical wiring issues and repairs, replacing or installing new equipment’s or appliances, maintaining of air conditioning system and many more. On the other hand, cleaning works involves cleaning activities such as dusting, sweeping, mopping, toilet cleaning, trash collecting where else the landscaping workers carry out garden works, tree trimming works, yard up keeping by using moving lawn and grass cutting works.

2.6 PHYSICAL HAZARDS

The physical hazard is defined as a factor, agent or even know as a circumstances that can cause harm whenever it contacts. Physical hazards most frequently have both human and natural elements that will cause physical harm to human body and also cause stressful conditions or situations. Physical hazards are very common in industries such as construction, maintenance and building services, manufacturing, agriculture

and mining industries that involves numerous work activities that requires physical contacts and usage of manpower to carry out the job. Typical physical factors include vibration, noise, and abnormal temperatures both high and low (Park, et al., 2019).

The most common types of physical hazards are work at height, slip and trip, abnormal temperature such as heat and cold, noise, ergonomics, vibration, electricity, light, confined space, ventilation, radiation and so on. Other than that, physical hazards are also contributed due to slips and trips, exposed machinery and moving objects, electrical circuits and conductors, falling objects, liquid spills and many others.

2.7 TYPES OF PHYSICAL HAZARDS

2.7.1 Work at height

Work at height means works which are carried out at anywhere or any place where a person could fall from height or vertical distance that are liable to cause personal injuries to himself. These includes works from a ladder, platform and scaffoldings. Work at height are normally carried out on roofs, on elevated structures, fragile surfaces, over pits, over tanks, on cliffs, step grounds and on top of vehicles such as on trailer or trucks. A fall from roof is the most common cause of fatality in construction sites (Abdul Hamid, et al., 2014).

A person is very likely to suffer from a serious injury, permanent disabilities or die if the worker falls from a height of two or more meters. Mostly, a fall from height occur due to poor edge protection, items being poorly secured or stored in place, unguarded openings, harness failed to be secured to the anchor points, improper guardrails or covers. There are countless number of jobs that impose risks when working at height such as construction, maintenance works such as window cleaning, painting and decorations, replacing roofs, and many others maintenance works.

Maintenance workers who do one off jobs at height without proper training, equipment's and planning are very much exposed to this hazard.

2.7.2 Slip and trip

The most dangerous accident that causes from slipping, tripping, falling objects and unstable work platforms (Ahmad, et al., 2016). Slip and trip is one of the most common hazard that are profound at workplace that leads to multiple numbers of undesired accidents at workplace. The most typical injury risks are slipping, tripping and a person falling and most common types of severe and fatal accidents during maintenance operations in industry were crushing and falling since more than one-third of accidents were caused by falling (Lind & Nenonen, 2008). Slip and trips normally occur due to loss of traction between the walking surfaces and shoe or even due to contact made with moveable or fixed objects that eventually leads to a fall.

A fall at workplace might cause concussion, injury such as twisted limb or even cause broken bones. Slip and trip most frequently also happens due to uneven surfaces, wet or greasy floors, polished floors, powder or wood dust on floor, carpets or mats, loose or missing tiles, sloped walkways, opened drawers, lack of traction on shoes, rain water, clutters, damaged stair or ladder steps, metal surfaces and so on. Maintenance works are prone to this hazard that will cause slip and trip among the workers and can be avoided by ensuring good housekeeping practices, avoiding wet or slippery surfaces, avoid creating obstacles at walkways, ensure proper lighting at workplace, wearing suitable footwear's and most importantly controlling human behavior by avoid running, using cell phone or taking shortcuts or wearing sunglass at low light areas.

2.7.3 Heat

Heat is one of the common hazard that are related to physical hazard. In the matter of temperature, other weather-related factors are for example

strong wind, snowing, darkness, excessive UV radiation and rain (Lind & Nenonen, 2008). The worker who works both indoor and outdoor who are exposed to heat or those who works in extreme heat are very much at risk. Long term exposure to abnormal heat or temperature can cause occupational illnesses due to heat stroke, heat exhaustion, heat cramp, heat syncope, heat rashes or death if not treated at right moment. Heat also increases the risk of injuries as a result of fogged up safety goggles, sweaty palms, dizziness or fatigue which will reduce the ability of brain to rationally and hallucination which additionally creating another hazard. The works should avoid the exposure to heat and direct sunlight if the exposure cannot be avoided. The management might reduce the heat hazard by rescheduling the maintenance period of the work, reducing the physical demands of works, encouraging workers to wear light, loose and breathable clothing's, providing rest periods with water breaks, personal protective equipment (PPE) and provide training for the workers to understand what is heat stress and how it can be avoided.

2.7.4 Noise

Noise is an undesired sound that are displeasing and disrupts the concentration and a usual physical hazard that are exist at workplace. Excessive exposure to noise can cause hearing loss, which can then lead to secondary communication problems (Park, et al., 2019). Excessive noise can cause temporary or permanent hearing loss as a result of prolonged exposure or improper usage of hearing protection. The noise is measured in decibels (dB) using sound level meter. Any noise above 70 dB over long period of time will damage the human ear and noise which are above 120 dB will cause instant harm to the ears. Machinery or equipment are the most usual source of hazardous noise at the workplace. Excessive noise and long term exposure to noise can cause various health issues such as stress, productivity loss, poor concentration, communication difficulties and fatigue due to effect on sleep and even will cause serious problems which are namely cardiovascular disease, hypertension and more. The exposure to excessive noise can be controlled by applying engineering modifications, administrative controls, substituting it with much quitter one, eliminate it if

possible and reducing the impact of it by using personal protective equipment (PPE).

2.7.5 Ergonomics

Ergonomics is a physical hazard or condition that will impose the risk of injury to the human musculoskeletal system. Musculoskeletal disorders (MSD) cause injuries to muscles, tendons, ligaments, joints, nerves and veins that are caused by our action and environment that fail to follow safe and healthy work practices. Most of the risks in companies were considered to involve poor ergonomics in maintenance operations due to poor working postures, heavy lifts and improper working methods and workers may be unaware of it (Lind & Nenonen, 2008). Ergonomic risk factors are from the workplace environment or situations that will be caused by wear and tear on human body that eventually results in injury. These include forceful motions, heavy lifting, repetitive actions or activities, overhead works, awkward or prolonged postures, direct pressure, vibrations, extreme temperature, stationary positions and work stress. By implementing engineering improvements such as redesigning, modifying, replacing tools and equipment and making improvisation on administrative control such as adjusting work schedule or pace, providing varieties of works instead of one, recovery time and modifying work practice with the help of personal protective equipment (PPE) will help reduce ergonomic related hazards at workplace.

2.7.6 Vibration

Vibration is known as one of the significant physical hazards that exist. Exposure to high levels of vibration can cause hand-arm vibration syndrome (HAVS), a typical occupational disease (Park, et al., 2019). High level of vibration will cause injuries and illness to human body if consistently repeated exposure towards it. Generally, there are two types of vibration exposure which are hand arm and whole body vibration. The hand arm vibration will

cause direct injuries to the fingers and hand that affects the sense of feeling and affect hand grip. Hand arm vibration injuries are closely related to use of equipment or appliances that has vibration such as impact drills, grinders, sanders, pavement breakers, saw machines, chipping hammers and air powered wrenches. Long term usage of vibrating machines will cause musculoskeletal disorders (MSD) that are known as Hand Arm Vibration Syndrome (HAVS). Whole body vibration cause lost time of production and will cause low back pain and injuries due to exposure of high level of vibration. The control measures that can be enforced are usage of machineries that are designed to decrease vibration, redesigning the machine to reduce vibration, regular work breaks, job rotations and change of body posture after sometime to minimize exposure time and adequate training and information is essential to ensure minimization of vibration exposure towards the workers.

2.7.7 Electricity

When a worker gets in contact with a conductor or other energized equipment, it will cause dangerous condition. Electricity can be either static which the charge accumulated on surface due to friction on contact with other surface. On the other hand, the dynamic electricity is the uniform motion of electric current which might end up in serious injuries. Electrical hazards can be divided into 2 groups which are primary and secondary (Ahmad, et al., 2016). The primary electrical hazards are one that flows current through human body that results in electric shock that cause severe and harmful effects to internal organs and its functions. The secondary electrical hazards are those which leads to other hazards such as fire, explosions, and several other effects essentially causing slip, trip, fall and many more when the current travels through the human body. Electrical hazards are very likely to happen in a substation where high voltage and currents are involved. Competency and adequate Personal Protective Equipment (PPE) is highly essential while carrying out works or maintenance operations.

2.8 CONCEPTUAL FRAMEWORK OF RESEARCH

There are four constructs and their respective indicators are formed in this research framework. The research framework is as figure below:

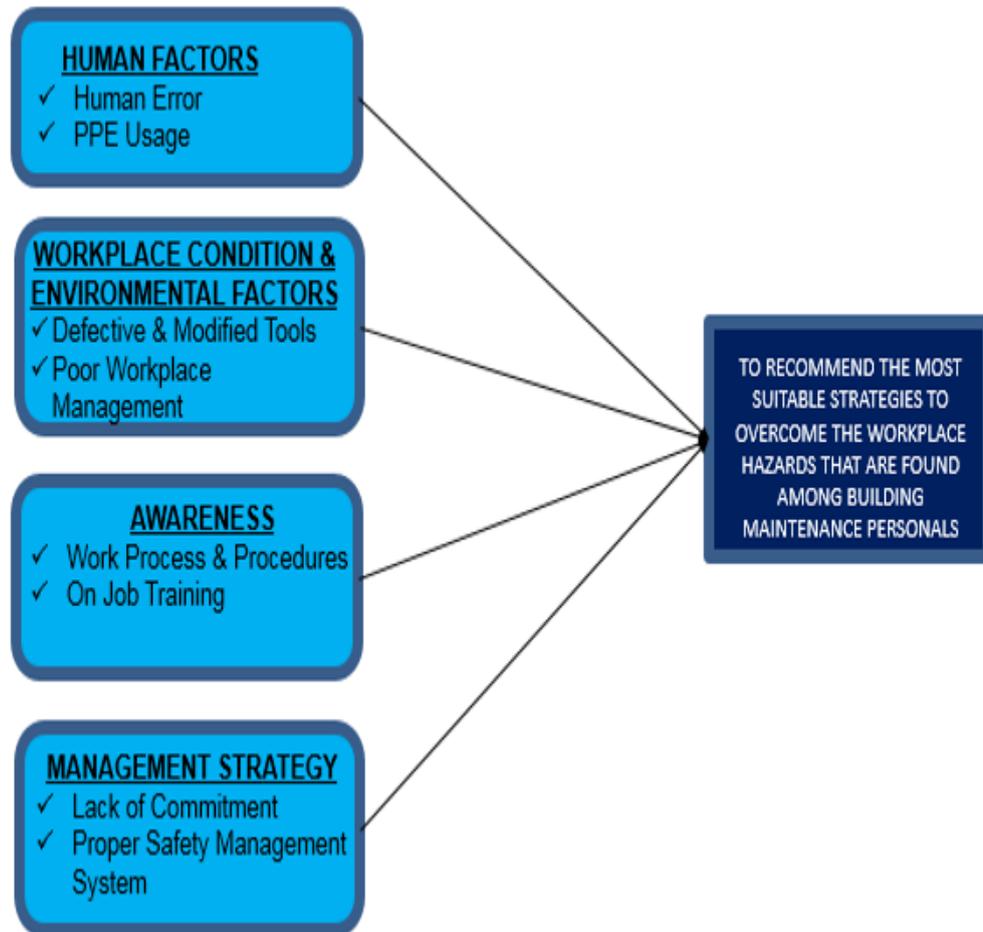


Figure 2.1: Conceptual Framework

Table 2.1: Literature Review

NO	FACTOR/STRATEGY	(Lind & Nenonen, 2008)	(Cortés-Pérez, et al., 2020)	(Hassim & Edwards, 2006)	(Ahmad, et al., 2016)	(Das, et al., 2008)	(Dhillon & Liu, 2006)	(Abdul Hamid, et al., 2014)	(Vredenburgh, 2002)	(Hosseinian & Torghabeh, 2017)	(Park, et al., 2019)	(Ahmed, et al., 2018)	(Tadesse & Israel, 2016)	(Abukhashabah, et al., 2020)	(Hoque, et al., 2017)	TOTAL REFERRED
1	Human Error					✓	✓	✓		✓				✓	✓	6
2	Failure to Use PPE	✓						✓		✓						3
3	Defective Tools		✓		✓					✓		✓	✓		✓	6
4	Poor Site Management	✓						✓			✓				✓	4
5	Work process and Procedure	✓	✓													2
6	On Job Training						✓	✓	✓	✓		✓	✓	✓	✓	8
7	Lack of Commitment					✓		✓	✓	✓		✓	✓		✓	7
8	Proper Safety Management System	✓				✓		✓		✓		✓	✓	✓	✓	8

2.9 LITERATURE REVIEW

2.9.1 Human Error

Human factors described by The Health and Safety Executive (HSE) as the perceptual, mental and physical capabilities of people and interactions of individuals with their job and work environment as well as the influence of equipment design and system design on human performance. It also notes that characteristics of the organization which influence safety-related behavior at work. Leplat, J. & Rasmussen, J. (1984) study has obtained data for predictive analysis which is necessary to analyze accidents and incidents in order to identify its causes in terms of component failures and human errors.

Human error may be defined as the failure to perform a specified task (or the performance of a forbidden action) that could lead to disruption of scheduled operations or result in damage to property and equipment (Dhillon

& Liu, 2006). Research evidence shows that about 80 percent of industrial accidents are caused by human factors such as fatigue and anxiety.

These causes arise out of the deficiencies of an individual himself, improper attitudes, carelessness, recklessness and day-dreaming while performing a job. Besides this, it could also be contributed by physical inadequacies such as poor eye sight, deprived hearing, defective limbs, low stamina or self-esteem and one's job preference; for example, a worker dislikes the job on which he is engaged in or he may not like the supervisor he is assigned to or the environment of work. Despite this, factors such as low intelligence, lack of manual skills, violations of safety rules and regulations as well as absentmindedness which may arise out of fatigue and anxiety or ignoring safety devices provided could cause accidents to happen. The human element or factor such as the negligence of the workers in doing their works will also lead to the accident (Abdul Hamid, et al., 2014).

All these factors affect for the worse, the alertness of any employee, distract him, make him lose his concentration on the job in hand may lead to accidents. Also, mistakes by workers is a human error whereby errors of conception are based on knowledge and rules established, its detection is difficult as they can remain dormant over time as it involves rules and knowledge which are very specific and subjective. Workers who have enough knowledge and training about how to perform their tasks will not be free of accidents if they do not change their behavior in terms of safety (Hosseinian & Torghabeh, 2017). Violating rules and regulations is a kind of human error when there are deviations from the operating procedures, standards and existing rules regarding safety maybe routine, non-routine or exceptional. The routine violations are presented in the level of skill-based behavior and take the least effort to accomplish the task. Besides this, outstanding violations are generated in the working conditions and are interpreted as necessary for the fulfillment of the task.

Particularly, worker perceptions of the level of managerial and supervisory safety concerns, together with safety hazards and worker safety

attitudes, explained about 35% of the variance in reported safe workplace behavior (Das, et al., 2008). Another factor is sabotage behavior which might induce one to harm people or equipment due to their own personal behavior or attitude which may contribute them to behave irresponsibly. Therefore, a proper understanding of human factors in the workplace is an important aspect in the prevention of accidents. According to Harris, A. (2004), human factors should be considered in any program to prevent those that are caused by human error. Research studies have shown that the human errors have been generally recognized as the major cause of industrial accidents (Reyes, et al., (2012). This problem is aggravated by increasing mental workload; e.g. stress or burnout among human in the current modern manufacturing environment. Besides this, company resources may be spent without proper planning and budget allocation due to the lack of understanding the losses which could be mainly contributed by human errors Cacciabue, P.C., (2000) which will in turn adversely affect the economic status of a company or organization.

2.9.2 PPE Usage

The accidents may also occur if the workers do not use the personal protective equipment (PPE) that has been provided by the management such as safety boots, safety belts, safety helmets, goggles and so on. If they failed to use the PPE as required, the percentage of the risks being exposed to them is even larger (Abdul Hamid, et al., 2014); (Lind & Nenonen, 2008). Personal protective equipment (PPE) is the last resort in the hierarchy of safety control measures after elimination, substitution, isolation, engineering control and administrative control. However, this control measure is equally important to prevent any injury from happening and could save one's life if the PPE is donned properly. Therefore, the probability may highly increase for a worker to get any undesired injuries while working without wearing suitable PPE. According to Dorji and Hadikusumo (2006), many workers gave feedbacks and refused to wear PPE with various reasons given such as feeling uncomfortable with the gears worn while performing their job at site

and considered it as hindrance to their work outputs and job performances. Despite this, the International Labour Organization (1996) revealed that some workers felt uncomfortable while donning any types of PPE and this indirectly diminishes their work performance. Other than this, the behavior and attitude of a worker who could be complacent and do not understand the importance of wearing and using the PPE provided to him properly may also cost one's life to be in danger. For example, if a worker has donned a safety harness while working at height but he did not hook the safety harness to the designated anchorage point deficit the purpose of him wearing the safety harness because without hooking onto the anchorage point, this safety harness will not serve as a fall protection equipment and may result him to fall from height. This could be prevented if the worker if aware of the consequences of him not hooking onto the anchorage point and be constantly reminded on the importance of wearing the safety harness and hooking it correctly could save his life. Thus, awareness among workers should be raised through trainings, campaigns, toolbox meetings etc. to instill good and safe working habits and behaviors among workers to prevent accidents from happening.

2.9.3 Defective and Modified Tools

It became obvious that the workers are the most adjustable part of the maintenance operation, in a case where there are defects in work environment or tools (Lind & Nenonen, 2008). Defective equipment or tools used to perform a job is deemed to be unsafe condition as it can directly cause any injury to workers according to Holt (2001). Accidents using defective equipment occur due to its poor performance because the existing faulty conditions of a machinery or equipment do not allow the execution of the task carried out using this defective machinery safely. According to Tool (2002), poor management of equipment, inappropriate selection and procurement of a machinery or equipment to perform a task as well as poor maintenance will result in more injuries. The distinguished risks reflected defects in planning of maintenance operations and work environments

(including processes/machinery and walking and working surfaces) (Lind & Nenonen, 2008).

Machinery which is poorly maintained could cause accident to happen due to various reasons such as loose moving parts, unsecured machinery parts, absence of guarding component of a machinery or equipment, damaged electrical cable, missing parts, absence of maintenance, wear and tear etc. As an example, a poorly maintained machinery could cause hand or finger injury to happen to a worker who uses the faulty machinery to carry out his job task given; e.g. worker uses a hand held circular saw to cut plywood but due to poor maintenance of this equipment, the guarding component of this hand held circular saw could have been damaged or dysfunctional hence this could directly cause the worker to sustain hand or finger injuries which may cause either his hand or finger to be amputated and could suffer from a permanent disability for life. However, this could be prevented from happening if proper and timely maintenance of the equipment was carried out and certified to be safe to be used by authorized personnel.

Environmental conditions which feature the physical environment of any working conditions such as lighting, noise, vibration and temperature may influence occupational accidents to happen too. Working environments with poor lighting, noisy, strong vibration extreme temperatures and oxygen deficiency are classified as unfavorable working conditions therefore extra precautionary safety measures need to be considered and taken for workers if they are required to perform jobs in any of these unfavorable working conditions e.g. provision of suitable PPE, job rotation, continuous health monitoring, provision of frequent breaks and so on.

2.9.4 Poor Workplace Management

According to Holt (2001), work site is one of the most dangerous or risky workplaces with many hazards present to workers while they are performing their tasks. Poor general order and tidiness, such as storing

goods on walking and working surfaces, caused risks on some sites (Lind & Nenonen, 2008); poor site management contribute significantly to the unsafe acts and conditions (Abdul Hamid, et al., 2014). Good housekeeping practices involves proper use, storage, cleanup and disposal of unwanted materials used after maintenance works are being completed. Federated (2007) specified that poor housekeeping practices cause several impacts such as waste of time, energy and materials as well as increase the probability to cause injuries and fire due to presence of combustible materials around the work area.

Many hazards are present in poorly managed work sites such as fire hazards, tripping hazards, chemical hazards, falling objects etc. which may all contribute for accidents to happen in a work site. As an example, a work site without proper housekeeping practices may cause a worker to slip, trip and fall due to poorly arranged materials which are not within suitable storage areas, without demarcation and inappropriate signage's displayed as well as not well segregated. Therefore, 5S good housekeeping practices should be adopted in all work areas which in orderly includes sort, straighten, shine, standardize and sustain. By adapting to good housekeeping practices, many benefits could be obtained such as cost-saving in terms of medical bills, insurance, rehabilitation cost (physiotherapy) to be paid for the injured worker, increase productivity and efficiency of a job performed because good housekeeping practices can help to save time when all materials needed to carry out a task are easily accessible and taken when they are neatly sorted and arranged orderly.

2.9.5 Work Process and Procedures

Unsafe method can be defined as incorrect procedures and work styles that have been practiced by the workers due to the insufficient information from the management resulting in workers disobeying the works procedures; In addition, the level of knowledge and skills of the workers towards the procedures that have been taught to them will contribute to the

proper execution of works (Abdul Hamid, et al., 2014).

Safety information should include information about work-related hazards, and knowledge (including skills) regarding how work should be done (Lind & Nenonen, 2008); (Hosseinian & Torghabeh, 2017). When the workers are acknowledged with the hazards, they will be much careful while carrying out the work. The frequency of performing task in unsafe manner should be determined by the investigator so that necessary acting can be taken before unwanted accidents happened (Hosseinian & Torghabeh, 2017). To support safe working practices, it must be ensured that workers are instructed in safe working methods before they carry out maintenance operations independently on sites (Lind & Nenonen, 2008).

2.9.6 On Job Training

Training can be classified into several types and on-the-job training is one of the most important type among them. As a responsible employer, one should provide safety training and motivation program to the workers in order to enhance the worker's knowledge and discipline (Abdul Hamid, et al., 2014). To improve the quality of safety and health for all employees, organizations should institute a systematic, comprehensive safety and health training program for new employees, provide a mentor for these employees, and use a buddy system to help orient new employees in the safety and health and quality systems (Vredenburg, 2002). This type of training is usually implemented by organizations that have new employees who joined in the company.

This type of training is usually conducted to place the new employees who are more experienced to work together and to guide them throughout the work for certain period of time. The presentation of knowledge for this type of training is usually carried out in the workplace and on weekdays during working hours. It is either delivered in the form of talks, briefings or short courses managed by the organization. Examples of programs implemented

for this type of training are job instruction training, job rotation, coaching and mentor-mentee program. At the end of the on-the-job training program, evaluation will be done by mentors on their respective mentees job performance and this will help them to perform their work well.

2.9.7 Lack of Commitment

The poor, incomplete and non-enforceable company's safety policy, rules and regulations will also lead to the occurrence of the accidents if the management themselves are not keen in putting the safety policy, rules and regulations they created into practice, the workers seem could not care less (Abdul Hamid, et al., 2014). Management's commitment to safety is a major factor affecting the success of an organization's safety programs (Vredenburgh, 2002); (Hosseinian & Torghabeh, 2017). Organizations which have safety policies, procedures and practices in place usually give overall importance and true priority to safety at work. Holt (2001) revealed that both management and employees have to be actively involved and committed in order to ensure the effectiveness of the safety policy and procedure. Meanwhile, research by Sawacha et al. (1999) found that companies with effective and efficient safety committee members are more likely to take steps and put in effort to improve safety performance than those without. Working with lack of concentration and commitment could cause distraction and may result in accident. Besides that, accidents which happen in work site also contributed by working without authority or supervision, failure to warn others of danger, missing platform guardrails, inadequate fire warning systems, excessive noise, poor illumination, financial restrictions, lack of education, restricted training, poor quality control system, lack of resources, group attitudes, work overload, industry tradition, society attitude to risk-taking and commercial or financial pressure between contractors.

Despite this, operational process whereby the formal process by which the vision of an organization is carried out consisting of operations, procedures and working methods by which all employees should follow and

use a guidance in performing their daily job tasks. Therefore, employees of any organization who follow safety policy, procedures and work operation instructions are usually committed and have sense of responsibility while performing their daily works. This will indirectly reduce the possibility of accident from happening when employees are dedicated to their jobs.

2.9.8 Proper Safety Management System

The management should be responsible for the accident prevention and the management should provide workers with safety facilities to prevent the workers from hazardous environment (Abdul Hamid, et al., 2014); (Hosseinian & Torghabeh, 2017). Effective safety management system reduces the risks of workplace incidents, injuries and fatalities through data driven measurements and improvements by involving people from different parts of the organization to make safety as a shared responsibility. Therefore, safety system should support the method of identifying hazards within the organization and assess the risks associated with hazards. It is important to determine the methods of control, resulting in the organization's written procedures and arrangements. Therefore, with proper and effective safety management system, an organization will be able to drive the company in the right direction to achieve its organizational vision and goals.

2.10 CONCLUSION

At the beginning of this chapter, the importance of facilities management has been described and has been briefly explain about the four pillars of facilities management. Besides that, maintenance is performed in order to maintain all necessary requirements to fulfill the business needs and all its related activities that are involved were explained. Workers safety has been the primary concern while carrying out the maintenance job. By referring at previous literatures, it has been found that physical hazards are

among one of the most persistent hazard that exist among maintenance personal and they are prone to many types of physical hazard while carrying out the works.

Hence, several previous journals were being researched to gain information about the physical hazards and its necessary information's. Based on the previous studies, four main construct has been identified as a strategy to overcome occupational hazards at the workplace. Those four constructs included the human factors, workplace conditions and environmental factors, awareness and management strategy that could be an effective strategy to overcome the occupational hazards at the workplace.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter explains about the concept of research methodology on the research that are being carried out in detail and theoretically explains about how to conduct the research. The main aim of research methodology is to explain the method that are been used by the researcher (Maxwell, 2012). The methodology is a method that are used in response to the research questions to collect the data more efficiently and gives a comprehensive examination of the techniques that are applicable to the field of study.

Therefore, choosing appropriate method for the study will ensure that the findings and results at the end of the research are reliable, correct, valid and accurate. Research methodology consist of several vital aspects such as form of research, conceptual framework of research, method of collecting data and method of data analysis. Each and every aspect are essential for the study to be carried out effectively and in a systematic manner to ensure that the outcome of the research is exceptional.

The research design is a strategy for reacting to our research question. Even though research design and research method are different, they are closely related since a good research design ensures that the data obtained helps us to respond more effectively towards our research questions. Hence, choosing the most suitable strategy for the research depends on the research objective, problem statement and analysis of the data. In a nutshell, the methodology in the study should be well designed and applied in comprehensive and precise manner in order to ensure that the process before and during the research can be carried out without any obstacles that may affect the study.

3.2 PHILOSOPHY AND RESEARCH APPROACH

There are several philosophy and research approach are found in a research study. The Saunders Research Onion has been widely accepted by researchers as a research approach to conduct the study. The Saunders Research Onion described the steps that are involved in research work implementation and was established by (Saunders , et al., 2007). The research onion consists of six layers which are namely philosophy, approach, methodological choice, strategy, time, techniques and procedures (Saunders et al. 2012). In other word, the onion layers provide much more detailed description of the phases of a research process.

It offers an essential pathway through which it is possible to design a research methodology for the study. The adequacy resides in its adaptability to almost any kind of research methodology and also can be utilized in a wide range of contexts (Bryman, 2012). Saunders et al (2012) describes that one must go from outer layer to inner layer when using the research onion. When observed from the outside layer, every layer of the onion for the research will be explained in detail (Saunders , et al., 2007). In the process of unwrapping the research onion, the outer layer of the onion should be unwrapped in order to the see the inner layer. The pragmatism is a research philosophy that explains the relevant concept to support their action (Saunders et al. 2012).

This study uses pragmatism as the research philosophy for data collection technique and analysis procedures in research design to facilitate a reliable and relevant data collection to be taken. In general, there are three different types approach which are frequently used in a research study such as deductive, inductive and abductive. Each approach that are been carried out contains different meaning and procedures. Hence, pragmatism is chosen philosophy by the researcher for the study to explain the technique or the method. The approach that are been utilized for this study are such as the deductive, inductive and abductive.

a) Deductive

Deductive is an approach that utilizes quantitative. The deductive method establishes the hypothesis or theories on a pre-existing theory and then formulates the methodology to analysis to evaluate it (Silverman, 2013). The deductive method can be considered as particularly useful for the positivist approach that enables the development of hypotheses and the statistical evaluation of expected results to an agreed likelihood point (Snieder & Lerner, 2009). It is characterized as the development from general to particular: it first establishes the general theory and knowledge base and then tests against it the specific knowledge gained from the research process (Kothari, 2004). However, the qualitative research methods may also use a deductive approach although in these situations the assumptions of pre-existing research would be developed differently from hypothesis testing (Saunders , et al., 2007). Besides that, Deductive approach utilizes questionnaire to establish observation understanding that enables you to compare different people's understanding by statistical data. The information gathered helps to confirm or reject the question which makes it possible to repeat the process.

b) Inductive

The inductive method allows you to create a hypothesis rather than follow, as in the deductive, a pre-existing one. It simply illustrates the difference between the two methods. The inductive approach is a step from the individual to the general (Bryman & Bell, 2011). There is no framework in this approach that initially informs the data collection and therefore the research focus can be formed after the data is collected (Flick, 2011). Although this can be seen as the stage at which new theories are developed, it is also true that it can be found to fit into an existing theory as the data are been evaluated (Bryman & Bell, 2011). Moreover, this method is commonly used for qualitative research. Interviews are conducted concerning specific phenomena then the info could also be examined for patterns between

respondents (Flick, 2011). Other than that, this approach can also be used effectively within positivist methodologies, where the data is initially analyzed and significant patterns are used to inform results generation.

c) Abductive

With the observation of the real world situation, the abductive approach is developed. This approach is carried out to research a circumstance and identify its pattern to come up with a new theory for the study. For instance, Human psychology or human opinion of a specific situation. Therefore, both qualitative and quantitative approaches are required to determine the condition. The findings are based on qualitative as well as quantitative data findings.

The abductive method, on the other hand, helps researchers to interpret results based on more than one point of view which is important for this research study. Therefore, an abductive approach was chosen by the researcher to analyse the data in the study on 'Workplace Hazard among Maintenance Personnel'. Other than that, this approach has been put into use to achieve the desired aim and research objective of the researcher. Mixed method has been selected by the researcher to facilitate this research. Therefore, the researcher used abductive approach to carry out this study.

3.3 RESEARCH DESIGN

Figure below illustrates the research Design based on (Maxwell, 2012) concept.

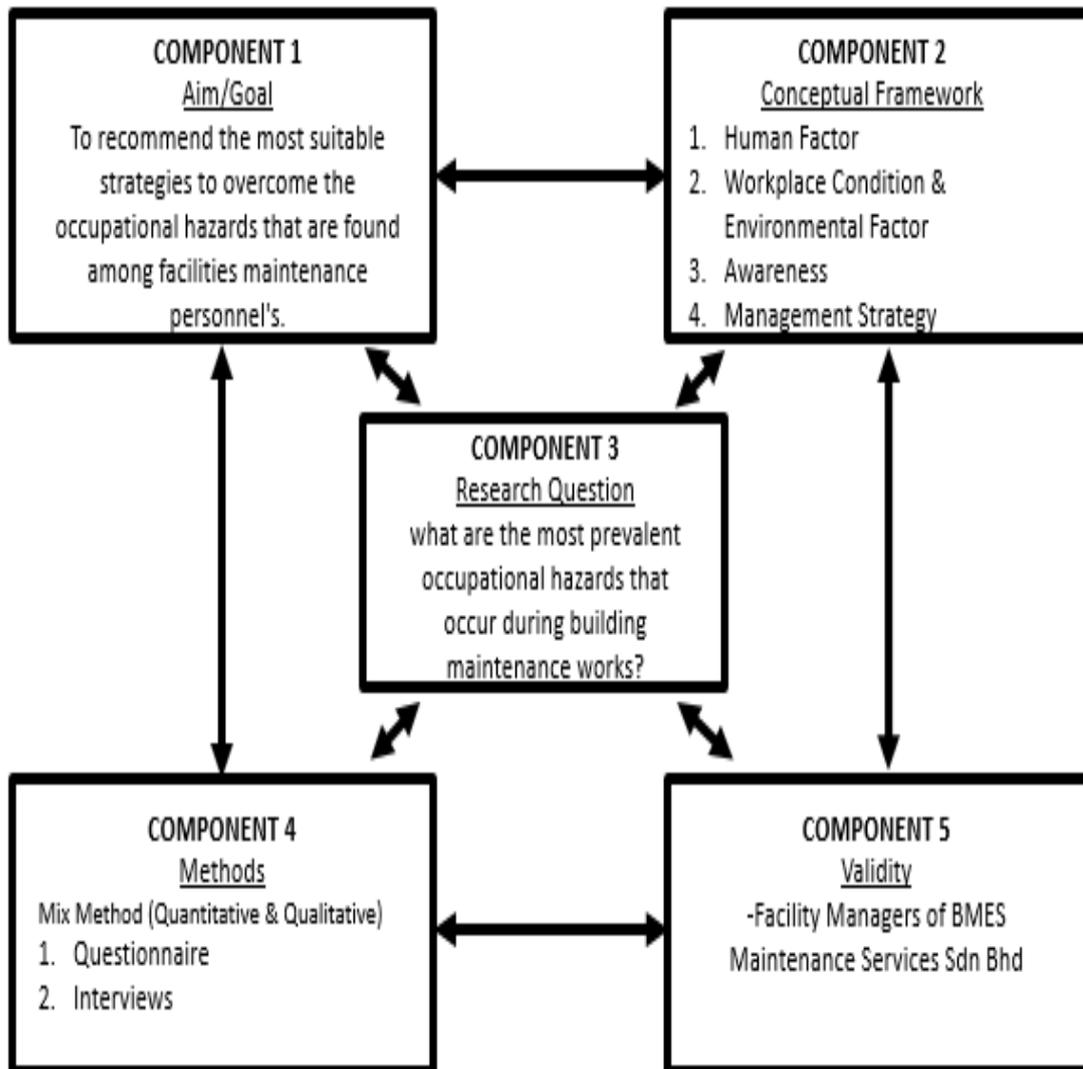


Figure 3.1: Research Design

3.4 METHOD OF DATA COLLECTION

Data collection is a method of gathering information from all relevant sources, seeking answers to the research question, evaluating the hypothesis and analyzing the findings. Method of data collection is divided into two categories which are primary data collection method and secondary data collection method. Primary data collection method is separated into two groups which are qualitative and quantitative. On the other hand, secondary data collection method is derived in the form of data that has already been released in journals, articles, magazines, publications, online portals and so on. There are lots of data that are available in these sources usually regardless of the complexity of field of study. Survey method are widely used by the researchers to observe a certain situation at a certain time and frequently used to obtain information through data collection. Survey is known to be one of most convenient and popular method by which utilizes the questionnaire that will be handed out to the respondent to gain necessary information for the research. That information will be processed by using analysis method which are planned by the researcher. Most of the time, this method used to investigate a certain product or design with the help media such as television, newspaper, magazine to gain review or opinion on certain criteria.

Besides that, survey contain several characteristic features which can be used for wide range of perspective which are generally to illustrate a certain behavior, attitude, a view or belief. Furthermore, the comprehensiveness of survey gives opportunity to be used to state multiple problems and issues in the form of question. The best way to collect data is through distributing questionnaires, interviews or else both of them. A study questionnaire will provide the answers directly by the study subject after the question has been given. For that reason, the questions that are provided to the respondents should short, clear and easily understandable where else the collected data might be inaccurate or untrustworthiness. Thus, both questionnaires and interviews will be utilized to obtain the data for the

research. Interview session will be conducted to acquire the data for the research and several maintenance and management staff will be interviewed which includes the Facility Managers, Managers, executive, supervisor, technician and maintenance workers. As stated above, the mixed method has been chosen for this research.

3.4.1 Questionnaire

Using questionnaires as a more practical and effective tool can help reduce the expense, time and energy of data collection (Kunting, 1998). Questionnaire is a form of instrument for obtaining facts about a current situation and practice enables one to study attitude and opinion as well. Depending on the nature of the queries, the questionnaires can be categorized as both quantitative and qualitative methods in general. The responses received by closed-ended questions with multiple-choice response choices are evaluated using quantitative methods and may include pie charts, bar charts and percentages. Answers to open-ended questionnaire questions are evaluated using qualitative approaches, including dialogue and critical analysis without the use of statistics and calculations. Normally it will be enough for a typical 15,000 to 20,000-word business paper, with 25-40 questions in questionnaires. It is necessary to formulate questions in an explicit and straightforward manner and present them in a logical order. Questionnaire benefits include increased data collection speed, low or no cost requirements, precise and higher objectivity levels compared to many alternative primary data collection methods.

3.4.2 Interview

Interviews are a two-way communication process for getting real information (Chua, 2006). Interview consists of the three types, which are structured interviews, unstructured interviews and semi-structured interviews. Structured interviews are a form of questionnaire that is delivered orally. It is

a very formal type of interview that consist several questions which are given or placed in front of the interviewee and each and every one of the questions will be asked in orderly manner. The unstructured interviews consist no prepared questions for the interviewee since it is more spontaneous and opened up type of interview. The purpose of the unstructured interview is to explore more new ideas and as outcome of the interviewee's emotions or personal thoughts. On the other hand, semi-structured interviews are frequently used in qualitative research. It is a combination of structured and unstructured interview This type of interview is very flexible and it enables the interviewer to investigate and expand the respondent's response or to gain in depth response from the interviewed person. Moreover, the main question which are related to research will be prepared and the subsequent questions arise based on the interviewees response or answer towards the question. Furthermore, interviews are focused at two categories which are group and 1-on-1 Interview sessions.

One-on - one (or face-to-face) interviews are one of qualitative research's most common types of data collection method. The interviewer collects data from the interviewee's responses immediately. This data collection method is ideal because it is a very personal approach when you need to gather highly personalized data. The process of collecting data from focus groups is simply an interview procedure, but we have a group discussion here instead of doing it 1-on-1. If resources are limited for 1-on-1 interviews (whether in terms of people, money or time) or you need to simulate a particular social circumstance to obtain data on people's behavior and attitudes, focus groups can be very convenient. Ideally, there should be 6-10 participants in a focus group, including a moderator. Of course, there should be some common denominators for all focus group participants based on the research objective and what the data collected is to be used for.

3.5 CONCLUSION

At the end of this chapter, we can know the research method that is chosen to obtain data and information that are relevant to occupational hazard among building maintenance personal which particularly focused on physical hazards mainly as per stated at scopes of research. Although we can know that this research began with a lot of reading from journal and articles, this chapter summarizes on how the collected data by referencing from previous journals and articles can be developed moving forward. Other than that, the instruments that are going to be used in this research is also stated in this chapter, which are interviews and questionnaires. Moreover, conceptual framework is also prepared to make the process of obtaining data much easier. Objective of these responses are to get valuable information and data regarding occupational hazard among building maintenance personal.

CHAPTER 4

DATA COLLECTION

4.1 INTRODUCTION

This chapter will describe the method that will be used to collect data in a broader perspective for the research paper. Collecting the data for the research is an important element since it helps to gain necessary information and enables the researcher to achieve the research aim. Data collecting is vital part of the research as for the reason that a good research paper starts from beginning stage to the final stage where the conclusion for the research will be determined from the data collection.

Other than that, the primary focus of this chapter will be also on sampling and the instruments that will be chosen to collect data and to access the response from the respondents to study the workplace hazards that exist among building maintenance personal. Teherani (2015), stated that method of data collection is important by the reason that it gives an idea on how the data that has been collected were been used and also to know that what explanation can be generated from it. As been stated on the first chapter, this research consists of three objectives and the research questions will be generated in order to gain data to answer those objectives and achieve the aim of the research.

Sampling design by (Saunders , et al., 2007) is used for the research. One must go from outer layer to the inner layer while using the research onion (Saunders, et al., 2012). When noticed from outside, each and every layer of the onion explains the research process in detail manner Saunders, et al, (2007). In the process of unwrapping the research onion, the outer layer of the onion should be unwrapped in order to see the inner layer.

4.2 RESEARCH SAMPLING

4.2.1 Sampling Design

Sampling often assists a lot in research. It is also known to the most vital factors that determines the efficiency and accuracy of the results of your research. Whenever something goes wrong with the sample, then straightaway it reflects in the outcome of the research. Gathering data from each and every person in a particular group is often difficult when a research is performed onto a group of people. Therefore, a sample is chosen. The sample among a group of individual or people will be involved in the research.

The sample size design is resolved based on the purpose of study, sample size required, cost and time allocated (Sabitha, 2006). The sampling method are predominantly divided in two categories such as probability and non-probability. The probability sampling is where every member of a population has a known chance of participating in the study. A probability sampling means that every segment in the population has an equal probability of being incorporated in the sample. To do random sampling, sampling frame need to be created first as an approach and then use a random number generation computer program to pick a sample from the sampling frame (Zikmund, et al., 2013). Probability sampling methods includes simple, multistage, stratified, systematic, and cluster sampling methods.

Despite that, the non-probability sampling is where the sampling group members are selected on a non-random manner. Hence, not each and every population member will have a chance to take part in the study. A non-probability sampling is also linked with the design of case study research and qualitative study. For the matter of fact, most case study tends to focuses on small samples and are predetermined to analyze a real life phenomenon, not to draw statistical inferences in relation to the bigger population (Yin,

2009). The non-probability sampling methods includes quota, purposive, convenience and snowball sampling methods.

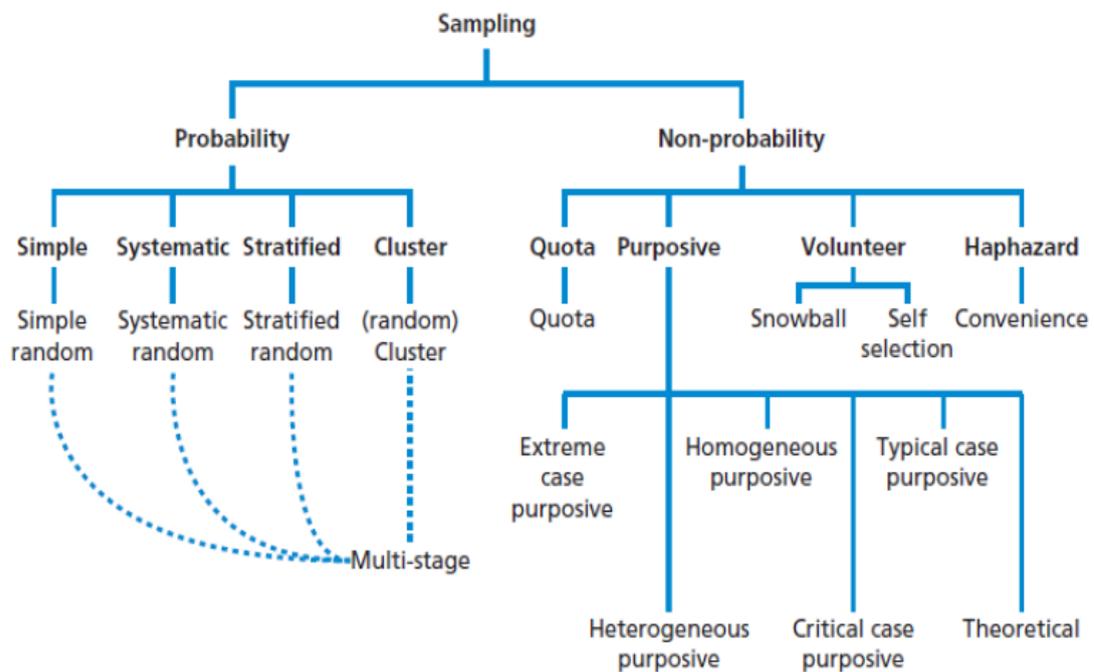


Figure 4.1: Specific sampling methods belonging to each category

Table 4.1: Probability Sampling

Sampling Techniques	Definition/Explanation
Simple	Sample group members are selected in a random manner.
Systematic	Including every Nth member of population in the study.
Stratified	Representation of specific subgroup or strata.
Cluster	Cluster of participants representing the population are identified as a sample group member.
Multistage	Sampling conducted at several stages.

Table 4.2: Non-probability Sampling

Sampling Techniques	Definition/Explanation
Judgement	Sample group members are selected on the basis of judgement of researcher.
Convenience	Obtaining participants conveniently with no requirement whatsoever.
Quota	Sample group members are selected on the basis of specific criteria.
Snowball	Sample group members nominate additional members to participate in the research.
Purposive	A group of subjects with certain characteristics is selected.
Self-selection	The self-selection samples involve two steps: i). Publicizing your need for units or cases ii). Checking the relevance of units(or cases) and whether inviting or rejecting it.
Homogeneous	All the items in the sample are selected following identical or similar attributes.
Heterogeneous	Every member has a different value for the featured interests. As an example, if everyone in the group varied between 4'2" and 7'5" height tall are considered to be heterogeneous for height.
Theoretical	The process of collecting, coding and analyzing data in a simultaneous manner in order to generate a theory.

4.3 SAMPLE SIZE

For the matter to generalize from a random sample and to avoid sampling error or partiality, a random sample needs to be of adequate size. The sample sizes reflect the number of responses were being obtained, and not necessarily, the number of questionnaire distributed (Bartlett, et al., 2001). The highly demanding need for a representative statistical sample in academic research have generated the demand for an effective sample size determination method. To notify and address the existing gap, (Krejcie & Morgan, 1970) brought up with a table to determine the sample size for a particular population for an easy reference.

Table 4.3: Sampling Size Table

<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

A whole population which is a total number of 60 respondents were been used as the sample in the research by the researcher due to small number of population. The three organization has an estimated similar population and sample size. The table below shows the sample size at three respective organizations that are used for this study.

Table 4.4: Sample size of the research

No	Organization Name	Total Population	Total Sample Size Required	Sample Size
1.	BMES Maintenance Services Sdn Bhd	20	60	20
2.	Puncak PKF Resources Sdn Bhd	20		20
3.	Wawasan Landscape Resources Sdn Bhd	20		20
Total		60		60

Table 4.4 above shows the sample size of the research. The total number of samples that are used in this research is 60. From the 60 samples, 20 samples are from BMES Maintenance Services Sdn Bhd, 20 samples are from Puncak PKF Resources Sdn Bhd and 20 samples are from Wawasan Landscape Resources Sdn Bhd.

4.4 DATA COLLECTION INSTRUMENTS

An instrument is known to be one of the most important method that are used in data collection process. Data collection and information gathering while carrying out the study can be divided into two which are namely primary data and secondary data. The primary data are the data or information's that are been obtain through methods such as questionnaire and interview's, and it plays an important role in concluding the results that are gained for the research.

It is a crucial information material in conducting the study since the data will be used to make analysis, planning and conclusion for the study and even finds out whether objective of the research is attained or not. On the other hand, secondary data is a data or information that are collected directly through studies on reading sources such as books, journals, magazine, thesis papers, internet and so on. The data collection instruments that are used in this study are questionnaires and semi-structured interviews. In this research, primary data was used.

4.4.1 QUESTIONNAIRE

Questionnaire is the instrument for collecting the primary data and also known to be one easiest method of collecting data (Cohen, et al., 2013). There are several benefits and advantages of using questionnaire as a data collecting instrument in a study such as the identity of the respondent can be kept as secret, the questionnaire can be distributed to many respondents at a same time and the cost of obtaining the data can be reduced. The data that were provided by the respondents are highly confidential and used for study purposes only. The items on the questionnaire questions are taken based on four constructs in the conceptual framework of the study. Besides that, the questionnaires are also created to be used in order to answer the first, second and third objective of the study and the data from the questionnaire will be main findings of the research and the responses of the interview respondents is to support the finding of the questionnaire. Therefore, this research is a Quantitative dominant research. This questionnaire consists of 4 sections.

- i. Section A: Demographic Details
- ii. Section B: To identify types of physical hazards
- iii. Section C: To Investigate the contributing factors which may cause accidents to happen
- iv. Section D: To Propose the most effective strategies to reduce exposure toward hazards

4.4.1.1 Section A: Demographic Details

Section A consists of demographic details of respondents such as organization name, age, respondent's gender, ethnic group, position held and work experience. This section is to know the pattern of respondents and would not be disclosed to any party.

4.4.1.2 Section B: To identify the types of workplace hazards which building maintenance personals are exposed to during their work.

Section B consist of 7 questions. This section is to answer the first objective of the study which is to identify the types of physical hazards which are building maintenance personal are exposed to during their works.

Table of Instrument 1: Questionnaire

ITEM	QUESTIONS	SCALE				
		1	2	3	4	5
B1	Does your work process involves working at height?					
B2	Have your ever experienced a slip, trip and fall while carrying out the work?					
B3	Do you work at a place that cause heavy sweating and exhaustion caused by the work environment?					
B4	Does your work involve exposure to excessive loud noise?					
B5	Does your work involve repetitive and awkward postures?					

B6	Do you frequently exposed to vibration from your tools and equipment while carrying out the work?					
B7	Do you ever encounter electrocution or electric shock while performing the work?					

4.4.1.3 Section C: To investigate the contributing factors which may may cause accidents to happen when maintenance works are being carried out.

Section C contains 14 questions and the questions are mostly intended and focused on constructs of conceptual frameworks. Besides that, it is also to answer the second objective of the study.

ITEM	QUESTIONS	SCALE				
		1	2	3	4	5
C1	I perform repetitive hand and arm movement in my work process.					
C2	I often encounter fatigue and anxiety while carrying out the work.					
C3	I feel uncomfortable while wearing the personal protective equipment(PPE) while performing the work.					
C4	I feel tired and exhausted due to my job requirements which leads to fast work procedures.					
C5	I am exposed to severe noise level that cause me to raise my voice while speaking to others at my workplace.					

C6	I am exposed to heat that cause sweating at workplace even when I am not working.					
C7	I have exposed to defective/modified tools and equipment which might cause physical injuries at my workplace.					
C8	I have a workplace which has a good housekeeping practices and has sufficient lightings.					
C9	I am unaware of the potential hazards at my workplace.					
C10	I am unaware of my work process and procedures.					
C11	I am provided with appropriate training by the management to perform the specified job at the workplace.					
C12	I am unaware about the organization's commitment towards safety practices.					
C13	I have been given limited time to perform the job which makes me to rush to complete my tasks.					
C14	I feel that effective job rotation helps employees to perform the job more effectively.					

4.4.1.4 Section D: To recommend the most effective strategy which could be implemented to reduce their exposure towards the hazards.

Section D consists of 7 questions. The questions are to answer the third objective of the study which is to propose the most effective strategies which could be implemented to reduce the exposure towards the hazards.

ITEM	QUESTIONS	SCALE				
		1	2	3	4	5
D1	Job intervals will help to reduce the fatigue and tiredness among the workers to perform the work safely.					
D2	Safety briefing is necessary for the workers before starting the job.					
D3	Tools and equipment should be inspected before usage.					
D4	Management attention to common accidents and developing strategies helps to keep it from happening.					
D5	Adequate training and continuous education enables the employees to be aware of the hazards at workplace.					
D6	Proper lighting and good housekeeping practices can avoid unwanted accidents at workplace.					
D7	Continuous monitoring on safety measures and up keeping of safety management system helps to manage workplace hazards effectively and minimize the chances of accidents occurrences.					

4.4.2 Semi-structured Interview

An 'Interview' is typically a face to face conversation between a researcher and a participant involving a transfer of information to the interviewer (Creswell, 2009). The semi-structured interviews are known to be one of the main method of obtaining information and this two-way conversation is aimed in order to gather information's for the research.

Mostly, the interviews are conducted orally and the responds or answer for those questions were recorded by the researcher in writing with the aid of video recording and appropriate electronic media. The face to face conversation between interviewer and respondents involves top level management and several qualified middle level management people in order to have a clear picture on the study that are been conducted.

By doing so, it ensures that the objective of this study are answered and allows the data to be collected validly by taking responds from the top level and middle level management. The interview respondents were provided with main questions and then followed-up questions based on the answers of the respondents. Therefore, semi-structured interview was selected since it is a combination between structured and unstructured interview.

All the data that were collected from the respondent will be analyzed and organized according to the requirement of study to suggestion and propose for further improvement. The data for the study were collected through the interviews with the respondent and all the data are based on interviewee's responds and suggestions to support the findings of questionnaires.

Table of Instrument 2: Semi-Structured Interview

1. What are the physical hazards that are found among building maintenance personals? *Apakah bahaya yang berkaitan dengan fizikal yang terdapat di kalangan pekerja penyelenggaraan bangunan?*

2. Which of the following physical hazards often cause utmost health or safety effect and why? *Antara bahaya fizikal yang berikut, yang manakah sering menyebabkan kesan kesihatan dan keselamatan yang teruk dan kenapa?*
 - i. Work at height
 - ii. Slip, trip & fall
 - iii. Heat
 - iv. Noise
 - v. Repetitive & awkward posture
 - vi. Vibration
 - vii. Electricity

3. What are the contributing factors that cause accidents to happen? *Apakah faktor-faktor penyumbang yang menyebabkan kemalangan berlaku?*

4. How to effectively manage those above factors? *Bagaimanakah cara untuk menguruskan faktor-faktor di atas dengan berkesan?*

5. In your opinion, what are the most effective strategies that could be implemented to reduce the exposure towards the hazards? *Pada pendapat anda, apakah strategi yang paling efektif yang dapat dilaksanakan bagi mengurangkan pendedahan terhadap bahaya tersebut?*

6. What is your suggestion to enhance and improvise the workplace safety & health management system to minimize the hazards? *Apakah cadangan anda untuk meningkatkan ataupun untuk menambahbaik sistem pengurusan keselamatan dan kesihatan di tempat kerja untuk mengurangkan bahaya?*

4.5 LIKERT SCALE

The researcher has used five Likert scales because it is a scale which are easy to build and simple to be controlled by the researcher. Moreover, the respondents are very likely and frequently had used Likert scale to answer a questionnaires and survey in the past since it is a common way of responding to a survey or questionnaire. The first option indicates the lowest score in the Likert scale which is 1 and the assessment is strongly disagree that allows the respondent to choose if the respond is very negative. The second option of the scales signifies disagree with the score of 2 for the respondents who has negative view but slightly lower than then the first option. The third option which is not sure with the score of 3 allows the respondents to choose this option when they are not sure or unable to make a decision for the question. On the other hand, the fourth option shows that agree with the scale of 4 which is a positive view on to the question that has been asked on the questionnaire. Last but not least, the scale with the highest score of 5 which is strongly agree allows the respondents to choose in order to provide their most positive view of a question.

Table 4.5: Likert Scale

Strongly disagree	Disagree	Not sure	Agree	Strongly Agree
1	2	3	4	5

4.6 PILOT TEST

The researcher has conducted a pilot study initially before conducting the actual study. The study was conducted on 10 employees. The pilot study was aimed to test the validity of the items used in the questionnaire questions that has been developed by the researcher. After the pilot study is completed, the researcher can determine the characteristics of the questions. By getting to know those characteristics of the questions, the researcher will be able to decide whether to modify or maintain the questions before carrying out the actual study. Besides that, it also enables the researcher to recognize or identify any research methods or instruments that are inaccurate or incorrect. A total of 10 relevant employees were been randomly selected to carry out this pilot study.

Table 4.6: Pilot Test Cronbach Alpha

Reliability Statistics	
Cronbach's Alpha	N of Items
.733	28

The main intention to carry out this study is to examine and ensure that the questionnaire questions are perfect, clear, straightforward instructions and easily understandable by the respondents while they fill up the questionnaire. Other than that, the researcher also conducted the reliability test on the items of the questionnaire. The questionnaire questions which are developed by the researchers have higher reliability if the value of the coefficient exceeds 0.7 and above. The researcher uses the SPSS software to test the reliability. The table below indicates the Cronbach Alpha for the questions that are been distributed to the respondents.

Table 4.7: Cronbach alpha score

Coefficient of Cronbach Alpha	Reliability Level
0.9 – 1.0	Excellent
0.8 – 0.9	Good
0.7 – 0.8	Acceptable
0.6 – 0.7	Questionable
<0.6	Poor
<0.5	Unacceptable

4.7 CONCLUSION

This chapter explains the method and approaches used in conducting the research to assist in order to obtain the data and the information needed to achieve the objectives of the research. Other than that, instruments that are used for data collection process are been described in this chapter. The data collection process for the research includes two data collecting instruments such as utilization of questionnaires and semi-structured interviews.

In a nutshell, this chapter has distinctly described that selection of instruments appropriate to the research plays a vital role in method of data collection. Other than that, pilot study has been conducted to increase the reliability of items in the questionnaires. Both of the instruments helped to ease the process of data collection for the research.

CHAPTER 5

DATA ANALYSIS AND DISCUSSION

5.1 INTRODUCTION

This chapter describes about the analysis process based on the findings that are obtained from the respondents by using the selected instrument methods which is semi-structured interviews and questionnaire. Data analysis is an activity which are carried out upon all the data are collected and ready to be processed in order to answer the research questions and objectives. Semi-structured interview questions were distributed to the top level and middle level managements respondents of three selected organizations which are BMES Maintenance Services Sdn Bhd, Puncak PKF Resources Sdn Bhd and Wawasan Landscape Resources. Due to the Covid-19 pandemic that evolved the world, the semi-structured interviews were carried on WhatsApp video call and Zoom Meeting since the interviews are conducted orally and the responds or answer for those questions were recorded by the researcher in writing with the aid of appropriate electronic media platforms.

Other than that, this chapter will also link to the findings from the semi-structured interviews as well as information which are gathered through questionnaires to support the interview responds that are given by top level and middle level management respondents. The questionnaires were distributed to respondents of those three organizations. The questionnaire was distributed via Google forms due to the pandemic. Despite the constraints, a total of 60 responses were received and each organizations represents 20 responses. That number of responses are considered good and accepted to perform the data analysis. All findings are summarized in the form of tables, pie charts and diagram to facilitate the readers to see the results which are made through the analysis in much easier and clear manner. The data that were obtained has been analyzed by using the Statistical Package

for Social Science (SPSS). Since the data are collected through Google Form, the results were extracted to Microsoft Excel sheets and translated to SPSS software. The method of analysis used are in the form of mean and percentage.

5.2 RESPONDENT'S DEMOGRAPHY

The respondents demographic describes the background analysis of the respondents who has answered the questionnaire that has been distributed. A total of 60 responses were received in order to support the responses which are gained through interview session with the top and middle management respondents. The respondent's demographic consist of:

- i. Organization name
- ii. Age
- iii. Gender
- iv. Position
- v. Work experience

All the information on the findings and information of the respondents are obtained from the distribution of the questionnaire and the analyzed results of the entire respondents are will be shown in the form of figures.

i). Findings and Analysis of Respondent's based on organization name

This section will describe about the background of respondents from three different organizations. The analysis of the data will be shown using the percentage and the figure below shows the number of respondents by each organization.

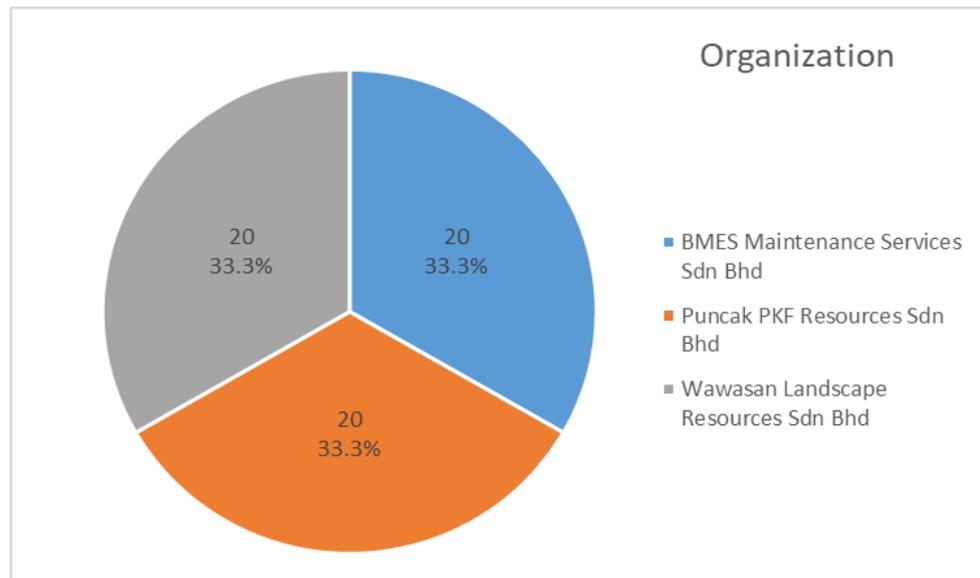


Figure 5.1: Pie chart of Respondent's Organization Name

Figure 5.1 above shows the number of three facilities management related organizations that are involved in the research study. The number of respondents who have responded and those responses that have received back was a total of 60 people from three different organizations. The results show that an equal number of 20 respondents from each of the three organizations have answered the questionnaire. A total of 20 respondents from BMES Maintenance Services Sdn Bhd, 20 respondents from Puncak PKF Resources Sdn Bhd and 20 respondents from Wawasan Landscape Resources Sdn Bhd have responded to the questionnaire. Therefore, it can be concluded that an equal number of 20 respondents has involved and has answered the questionnaire.

ii). Findings and Analysis of Respondent's based on age

This section describes about the respondent's background that are based on the respondent's age. The analysis of the data will be shown by using the percentage and the figure below shows the number of respondents by each age group.

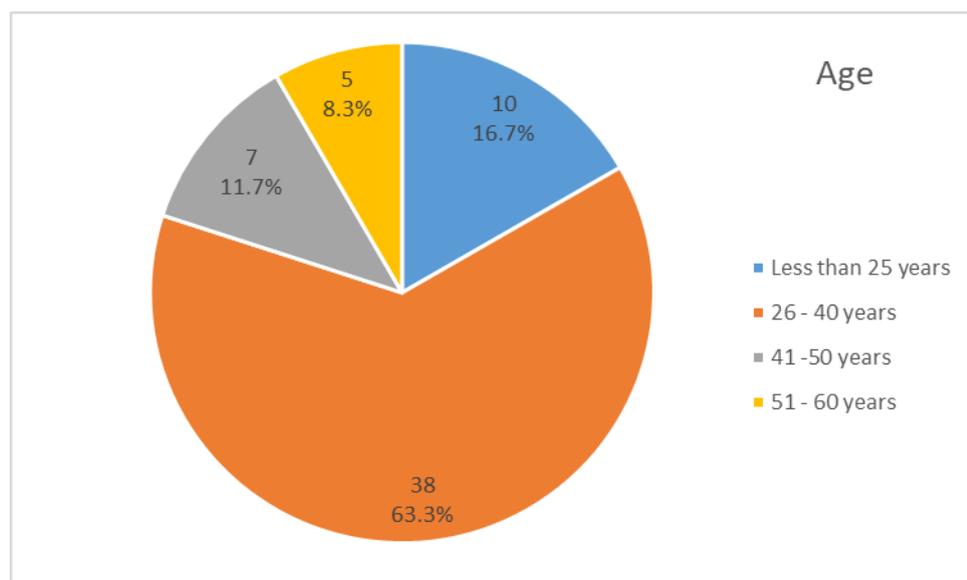


Figure 5.2: Pie Chart of Respondent's Age

Figure 5.2 shows the age category of the respondents that have responded to the questionnaire based on frequency and percentage. The result shows that the frequency of respondents who have answered the most questionnaire was from respondents aged 26 – 40 years old. Therefore, the percentage of overall respondents in that category was 63.3% with 38 respondents which makes it the highest compared to any other category or age group.

iii). Findings and Analysis of Respondent's based on gender

This section describes about the respondent's background that are based on the respondent's gender. Frequency analysis and percentage were used to analysis the respondent's gender.

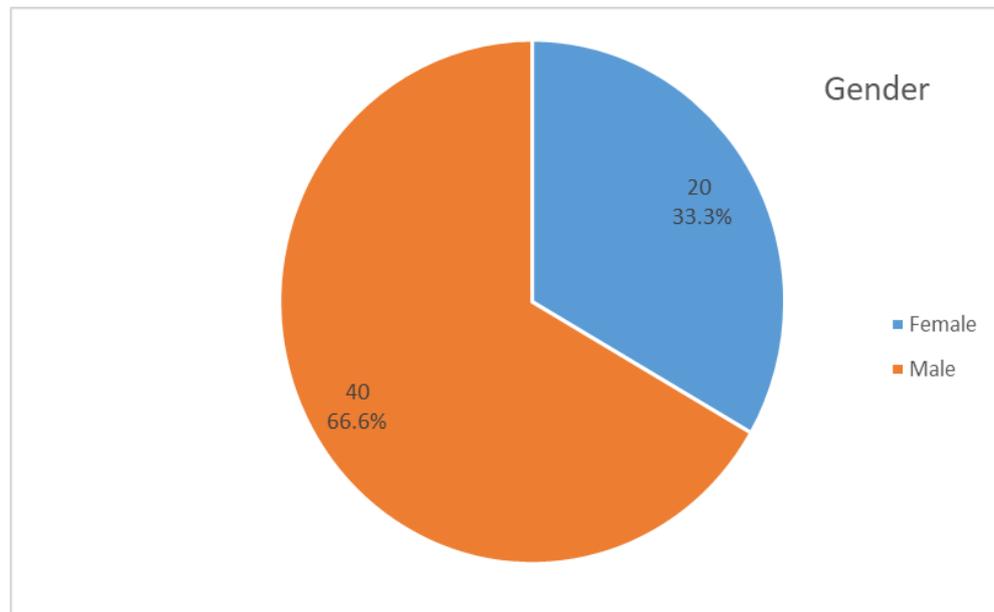


Figure 5.3: Pie Chart of Respondent's Gender

Figure 5.3 shows the total number of respondents based on their gender from the selected organizations. It also shows that the total number of respondents is 60 people. Among the 60 respondents, 40 of the are male respondents and 20 of them are female respondents. It shows that 66.6% of the respondents are male and 33.3% of them are female respondents. Therefore, there are more male respondents than the female respondents in the study.

iv). Findings and Analysis of Respondent's based on position

This section will describe the position of the respondents in their respective organization they are serving in. The percentage method is used to analyze the position of the respondents and the figure below shows the number of respondents according to their position.

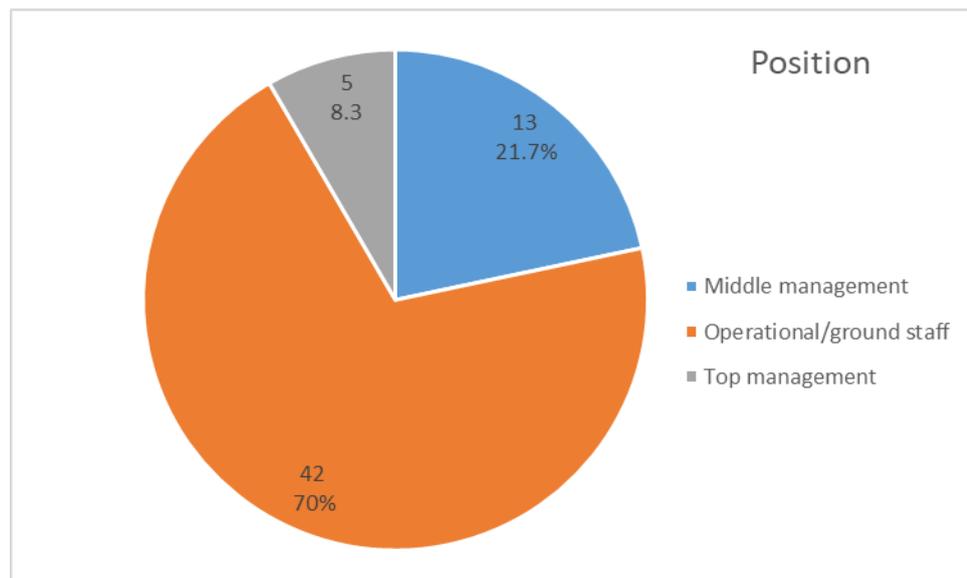


Figure 5.3: Pie Chart of Respondent's Position

Figure 5.4 shows the position of the respondents in the organization which are divided into three positions that are namely such as the top management, middle management, and operational/ground staff. After the sample was analyzed, the highest percentage of involvement which is 70% were being obtained from the operational/ground staff. It is followed by the middle management with the percentage of 21.7%. Last but not least, it was found that 8.3% of the respondents were from top management positions who have answered the questionnaire. Based on this pie chart, the respondents who showed the highest involvement were from the operational/ground staffs of the three organizations.

v). Findings and Analysis of Respondent's based on work experience

This section will describe the respondent's work experience in the organization they are currently serving. The percentage method was used to analyze the data and the figure below shows the number of respondents according to work experience.

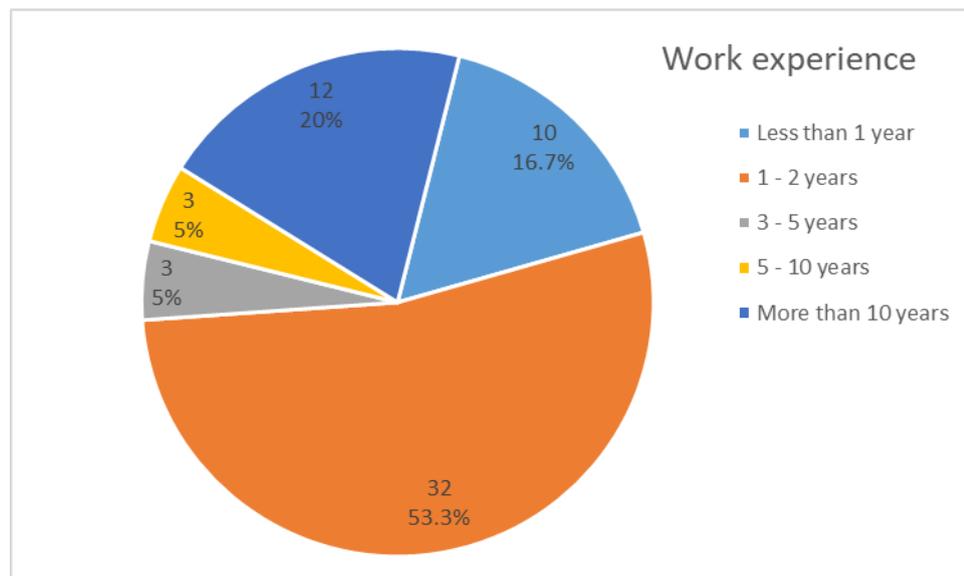


Figure 5.3: Pie Chart of Respondent's Work Experience

Figure 5.5 shows the respondent's work experience in the organization they are currently serving and the options which are given for the duration of work experience are less than 1 year, 1 to 2 years, 3 to 5 years, 5 to 10 years and more than 10 years. The results of the analysis found that 53.3% of the total respondents have work experience of 1 to 2 years followed by 20% of respondents with more than 10 years of working experience. Besides that, 16.7% of the respondents has a work experience of less than 1 year. Lastly, it was found that equal percentage of 5% of the respondents has a working experience of 3 to 5 years and 5 to 10 years. This indicates that majority of the entire population of respondents who have answered the questionnaire had a working experience of 1 to 2 year in their current organization.

5.3 FINDINGS AND ANALYSIS OF FIRST OBJECTIVE

This section aims to analyze the data to achieve the first objective of the research that is to identify the types of workplace hazards which building maintenance personals are exposed to during their work. The physical hazard is one of the most similar and common type of hazard that exist in all work element therefore physical hazards will be the main focus of the research. The data were obtained using quantitative method and the data were analyzed using SPSS software. The instrument used to obtain data is through distribution of questionnaire to respondents consisting of employees in the facility management related company from BMES Maintenance Services Sdn Bhd, Puncak PKF Resources Sdn Bhd and Wawasan Landscape Resources.

By using the instrument, the researcher was able to analyze the data that has been obtained in order to answer the first objective of the research which is to identify the types of physical hazards which building maintenance personals are exposed to during their work. The researcher uses the mean analysis to provide answer for the first objective. The mean is averaged by adding all the scores and diving it by number of respondents. By utilizing the mean analysis, average value of each set of data will be produced. Analysis on mean average on each data of the physical hazards were identified.

Data analysis for Section B: To identify the types of physical hazards which building maintenance personals are exposed to during their work.

Generally, this section is being carried out in order to identify the types of physical hazards which building maintenance personals are exposed to during their work. Those are the types of physical hazards that are building maintenance personals are usually exposed to while carrying out their works.

Table 5.1: Mean of types of physical hazards

ITEM	To identify the types of physical hazards which building maintenance personals are exposed to during their work.	N	MEAN
B1	Does your work process involves working at height?	60	4.30
B2	Have your ever experienced a slip, trip and fall while carrying out the work?	60	4.10
B3	Do you work at a place that cause heavy sweating and exhaustion caused by the work environment?	60	4.17
B4	Does your work involve exposure to excessive loud noise?	60	4.07
B5	Does your work involve repetitive and awkward postures?	60	4.15
B6	Do you frequently exposed to vibration from your tools and equipment while carrying out the work?	60	4.05
B7	Do you ever encounter electrocution or electric shock while performing the work?	60	4.12

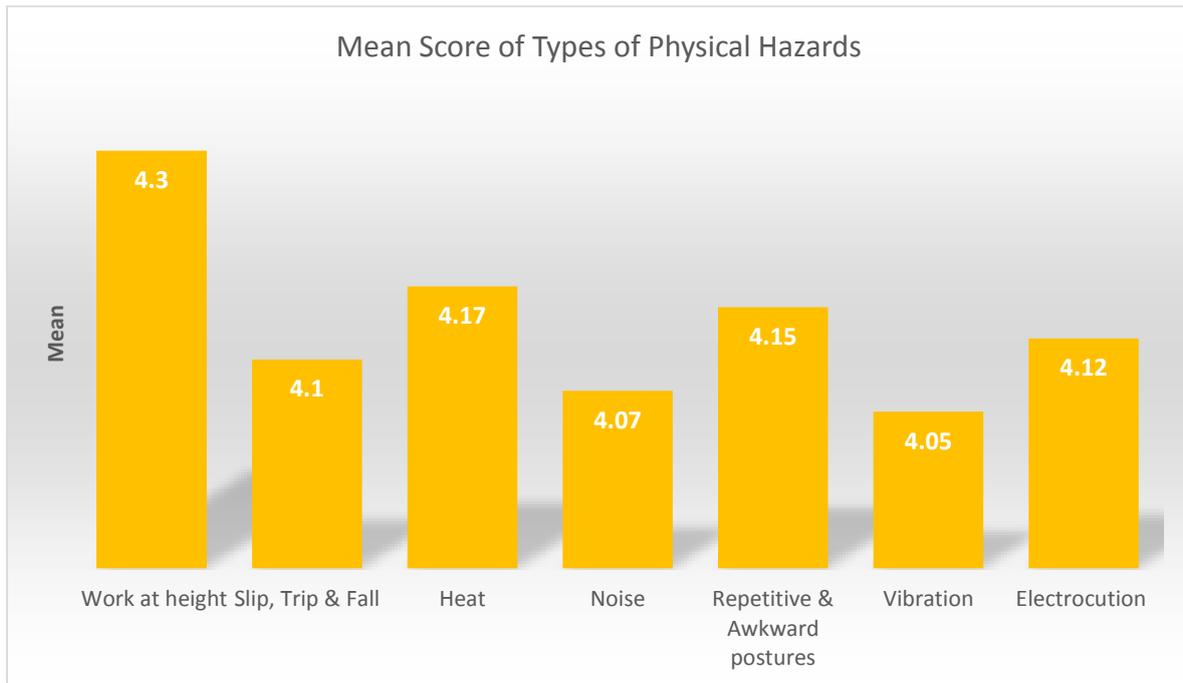


Figure 5.6: Mean Score of Types of Physical Hazards

Table 5.1 and figure 5.6 shows that mean score of types of physical hazards which building maintenance personals are exposed to during their work that has been obtained through SPSS software to analyze the data of the questionnaire. Likert scale were being used in this research which consist of scale 1 – 5 which are namely, scale 1 – strongly disagree, 2 – disagree, 3 – not sure, 4 – agree, 5 – strongly agree.

According to table 5.1 and figure 5.6, respondents agreed that work at height is the most common and also the dangerous type of physical hazard that building maintenance personals are exposed to while carrying out their works with the mean score of 4.30. It was obtained from the 60 respondents who completely answered and returned back the questionnaire. It shows that 53.3% of the respondents strongly agreed, 33.3% of the respondents agreed, 5% of them were not sure, 6.7% disagree and followed by 1.7% of the respondents strongly disagreed. Therefore, it can be defined that work at height is a common physical hazard that building maintenance personals are exposed to, since they are vulnerable to falling from edges, opening and fragile surfaces while carrying out the works.

Heat received a mean score of 4.17, with 45% of the respondents strongly agreed, 41.7% of the respondents agreed, 3.3% of them were not sure, 5% disagree and followed by another 5% of the respondents strongly disagreed. It shows that most of the respondents strongly agree that they are required to work on hot environments and heat that can cause body to be stressed from overheating. On the other hand, repetitive and awkward postures was given a mean score of 4.15 by the respondents since 46.7% of the respondents strongly agree, 36.7% of the respondents agreed, 5% of them were not sure, 8.3% disagree and followed by 3.3% of the respondents strongly disagreed. Based on the analysis, it can be defined that the building maintenance personals are required to work under constant and repetitive actions that needs abnormal body postures and continuous bodily activities at their works.

Next, a mean score of 4.12 were been given to the electrocution, with 50% of the respondents strongly agreed, 33.3% of the respondents agreed, 3.3% of them were not sure, 5% disagree and followed by another 8.3% of the respondents strongly disagreed. It shows that most respondents strongly agree that they are vulnerable to electric shocks that can lead current to pass into body due to exposed wires and improper insulations. Besides that, the slip, trip and fall obtained a mean score of 4.10, therefore 53.3% of the respondents strongly agreed, 30% of the respondents agreed, 1.7% of them were not sure, 3.3% disagree and followed by 11.7% of the respondents strongly disagreed. This indicates that they are high chances of being fall due to lack of traction and uneven work surfaces that can lead them to fell at the workplace.

Meanwhile, the noise was being given a mean score of 4.07 by the reason of 48.3% of the respondents strongly agreed, 31.7% of the respondents agreed, 3.3% of them were not sure, 11.7% disagree and followed by 5% of the respondents strongly disagreed. The analysis clearly shows that they are exposed to machines and equipment that can produce high decibels level of noise in their work activities. The lowest mean score of 4.05 were been received by the Vibration thereupon 45% of the respondents

strongly agreed, 35% of the respondents agreed, 6.7% of the respondents equally responded not sure and disagree and followed by another 6.7% of the respondents strongly disagreed to this item. This shows that most of the respondents agreed that they are exposed to vibration that are cause by the excessively vibrating tools that can effect tendons, muscles and body motions.

The inference that can be made from the overall mean score is that work at height received the highest mean score which makes it as the most common and also the most dangerous physical hazard which building maintenance personals are exposed while carrying out their works.

The implication is that majority of the respondents strongly agreed that work at height has the highest affect to them since their works require climbing on ladder which can lead to serious injuries or even death if they fall from a higher place.

The recommendation that can be implemented is that the management of the organization need to ensure that the employees are well trained and competent enough to carry out the work and ensure constantly supervise their works by inspecting and ensuring proper usage of personal protective equipment (PPE) and also good anchoring points whenever there is need of working at heights.

5.4 FINDINGS AND ANALYSIS OF SECOND OBJECTIVE

This section aims to analyze the data to achieve the second objective of the research that is to investigate the contributing factors which may cause accidents to happen when maintenance works are being carried out. The data were obtained using quantitative method and the data were analyzed using SPSS software. The instrument used to obtain data is through distribution of questionnaire to respondents consisting of employees in the facility management related company from BMES Maintenance Services Sdn Bhd, Puncak PKF Resources Sdn Bhd and Wawasan Landscape Resources.

By using the instrument, the researcher was able to analyze the data that has been obtained in order to answer the second objective of the research which is to investigate the contributing factors which may cause accidents to happen when maintenance works are being carried out. The researcher uses the mean analysis to provide answer for the second objective. The mean is averaged by adding all the scores and dividing it by number of respondents. By utilizing the mean analysis, average value of each set of data will be produced. Analysis on mean average on each data of the contributing factors were identified.

Data analysis for Section C: To investigate the contributing factors which may cause accidents to happen when maintenance works are being carried out.

Generally, this section is being carried out in order to investigate the contributing factors which may cause accidents to happen when maintenance works are being carried out. Those are the few of the contributing factors that has been identified which can lead for an accident to occur in a workplace.

Table 5.2: Mean of contributing factors which cause accidents to happen

ITEM	To investigate the contributing factors which may cause accidents to happen when maintenance works are being carried out.	N	MEAN
B1	I perform repetitive hand and arm movement in my work process.	60	4.15
B2	I often encounter fatigue and anxiety while carrying out the work.	60	4.13
B3	I feel uncomfortable while wearing the personal protective equipment(PPE) while performing the work.	60	4.35
B4	I feel tired and exhausted due to my job requirements which leads to fast work procedures.	60	4.10
B5	I am exposed to severe noise level that cause me to raise my voice while speaking to others at my workplace.	60	3.92
B6	I am exposed to heat that cause sweating at workplace even when I am not working.	60	4.17
B7	I have exposed to defective/modified tools and equipment which might cause physical injuries at my workplace.	60	4.32
B8	I have a workplace which has a good housekeeping practices and has sufficient lightings.	60	4.07
B9	I am unaware of the potential hazards at my workplace.	60	4.30
B10	I am aware of my work process and procedures.	60	4.07

B11	I am provided with appropriate training by the management to perform the specified job at the workplace.	60	4.05
B12	I am well aware about the organization's commitment towards safety practices.	60	4.12
B13	I have been given limited time to perform the job which makes me to rush to complete my tasks.	60	4.33
B14	I feel that effective job rotation helps employees to perform the job more effectively.	60	4.08

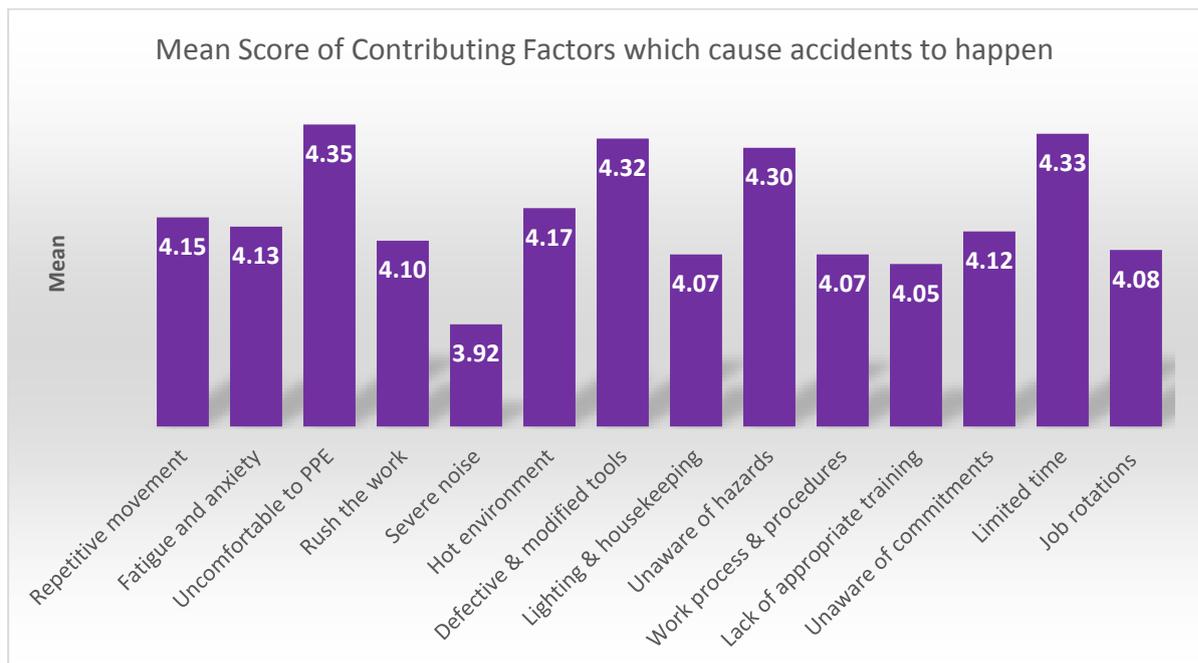


Figure 5.7: Mean Score of Contributing Factors Which Cause Accidents to happen

Table 5.2 and figure 5.7 shows that mean score of contributing factors which may cause accidents to happen when maintenance works are being carried out that has been obtained through SPSS software to analyze the data of the questionnaire. Likert scale were being used in this research which

consist of scale 1 – 5 which are namely, scale 1 – strongly disagree, 2 – disagree, 3 – not sure, 4 – agree, 5 – strongly agree.

According to table 5.2 and figure 5.7, majority of the respondents agreed that they were uncomfortable to their Personal Protective equipment (PPE) which received a mean score of 4.35 with 38.3% of the respondents strongly agreed, 60% of the respondents agreed, 1.7% disagree and none of the respondent answered not sure and strongly disagree for this item. Based on the analysis, it can be defined that the building maintenance personals feels uncomfortable to wear their PPE due to restriction of movement and impaired vision which eventually leads to an accident at workplace, thus making them to neglect the use of PPE while carrying out maintenance work.

Next, limited time were given to perform the job obtained a mean score of 4.33, with 36.7% of the respondents strongly agreed, 60% of the respondents agreed, 3.3% of them were not sure and none of the respondents answered disagree and strongly disagree. This indicates that the maintenance personals were not given enough time to perform a work which finally leads to rushing to perform the assigned work that increases the chances for an accident to occur in the workplace. Besides that, exposed to defective and modified tools received a mean score of 4.32, with 38.3% of the respondents strongly agreed, 58.3% of the respondents agreed, 3.3% of them disagreed and none of the respondents answered not sure and strongly disagreed. This shows that defective tools and malfunction of equipment elevate the chances for a building maintenance personals to be exposed to an accident which may cause severe injuries to head, eyes or other body parts.

On the other hand, unaware of the potential hazards at workplace has a mean score of 4.30, with 53.3% of the respondents strongly agreed, 33.3% of the respondents agreed, 5% of them were not sure, 6.7% disagree and followed by another 1.7% of the respondents strongly disagreed. Based on the analysis, it shows that most of the maintenance personals were unaware of hidden potential hazards that relay in their workplace which has higher possibilities for an accident to occur. However, mean score of 4.17 were

acquired by heat related and Hot environment of the workplace, with 45% of the respondents strongly agreed, 41.7% of the respondents agreed, 3.3% of them were not sure, 5% disagree and followed by another 5% of the respondents strongly disagreed. The analysis prescribes that building maintenance personals are exposed to heat environment which might increase the risk of injuries and accidents to take place due fogged up safety glasses, sweaty palms or even results in dizziness which subsequently contributes for an accident to happen.

On than that, Repetitive hand and arm movement in work process attained a mean score of 4.15, with 46.7% of the respondents strongly agreed, 36.7% of the respondents agreed, 5% of them were not sure, 8.3% disagree and followed by another 3.3% of the respondents strongly disagreed. According to the analysis, building maintenance personals are required to carry out certain daily work activities that needs performing of repetitive hand and arm movement which cause overexertion and muscle fatigue thus they might lose grip on their work tools and end up causing accident when maintenance works are being performed.

Moreover, more than half of the respondents strongly agreed that they encounter fatigue and anxiety while carrying out the work which received a mean score of 4.13, with 51.7% of the respondents strongly agreed, 31.7% of the respondents agreed, 1.7% of them were not sure, 8.3% disagree and followed by another 6.7% of the respondents strongly disagreed. Based on the analysis, majority of the respondents agree that they encounter fatigue and anxiety that makes them trouble in concentrating on maintenance and also makes them pay less attention on the work which contributes for an accident to take place.

Furthermore, unaware of the organization's commitment towards safety practice earned a mean score of 4.12, with 50% of the respondents strongly agreed, 33.3% of the respondents agreed, 3.3% of them were not sure, 5% disagree and followed by another 8.3% of the respondents strongly disagreed. The analysis show that building maintenance personals were lack of

awareness on management commitments towards safe practices therefore they were not enough exposure about the present dangers at workplace and poses very little knowledge and understanding on safety procedure which plays a vital role as a contributing factor for an accident to occur.

Meanwhile, tired and exhausted due to job requirements lead to fast work procedures gained a mean score of 4.10, with 53.3% of the respondents strongly agreed, 30% of the respondents agreed, 1.7% of them were not sure, 3.3% disagree and followed by another 11.7% of the respondents strongly disagreed. According to the analysis, tiredness and exhaustion plays major role as a contributing factor for accidents to occur as a result of loss of alertness and effects the ability of the workers to make necessary decisions while carrying out maintenance works.

Apart from this, Job rotation in workplace received a mean score of 4.08, with 31.7% of the respondents strongly agreed, 51.7% of the respondents agreed, 10% of them were not sure, 6.7% disagree and none of the respondents answered strongly disagreed for this item. The analysis shows that most of the respondents accept that they are exposed to focused physical demand one specific job that increases the opportunity of physiological strain, stress and fatigue which elevates the chance of accident at workplace.

A mean score of 4.07 were been obtained for unaware of work process and procedures, with 48.3% of the respondents strongly agreed, 31.7% of the respondents agreed, 3.3% of them were not sure, 11.7% disagree and followed by another 5% of the respondents strongly disagreed. Assumption that can be made from the analysis is that there are higher chances of accident to happen in a workplace if the maintenance personals were not well informed or lack of knowledge to perform a maintenance work due to improper work method been carried out which contributes as a factor for accident to occur.

Similarly, lack of good housekeeping and insufficient lighting gained a mean score of 4.07, with 48.3% of the respondents strongly agreed, 31.7% of the respondents agreed, 3.3% of them were not sure, 11.7% disagree and followed by another 5% of the respondents strongly disagreed. As stated in the analysis, the building maintenance personals are prone to falling or tripping at workplace due to improper housekeeping practices and lack of lightings in certain place of works which may result in serious injury or even end up causing accident while performing a maintenance works.

Along with that, appropriate training to perform specific job achieved a mean score of 4.05, with 45% of the respondents strongly agreed, 35% of the respondents agreed, 6.7% of the respondents equally answered that they were not sure, disagree and strongly disagreed for this item. In line with the analysis, most of the respondents agree with the statement that relevant job training to perform a certain maintenance work is important in order to complete a task without cause any injury or accident to themselves and to their fellow workers.

Finally, the lowest mean score of 3.92 was received for severe noise level that require raise of voice in workplace due to 41.7% of the respondents strongly agreed, 33.3% of the respondents agreed, 8.3% of the respondents equally answered that they were not sure, disagree and strongly disagreed for the item. As shown in the analysis, a good amount of respondents agree that they were required to raise or in need of speak loudly in order to communicate to their fellow employees whenever they perform maintenance jobs in plant which has running machinery or equipment which contributes for accident to happen due to improper communication between them.

The inference that can be made based on the contributing factor that cause accidents to happen is that the building maintenance personals feel uncomfortable to their personal protective equipment (PPE) thus making it to be known as the highest contributing factor for an accident to occur in workplace.

The implications from this result is that a large number of employees agreed that they feel uncomfortable due to the restrictions of movement and impaired visual cause by fogged up safety glass which makes them neglect the use of personal protective equipment (PPE) while carrying out maintenance works therefore elevating the chances of accidents at the workplace.

The recommendation that can be provided for the improvisation of the factor is by ensuring the personal protective equipment (PPE) fits well with the individual user to maximize the comfort level and suits with the maintenance activity so that they have higher mobility while performing their works. By doing so, the probability for an accident to occur can be reduce in much effective manner and enables the workers to carry out their job in a safe and healthier workplace condition.

5.5 FINDINGS AND ANALYSIS OF THIRD OBJECTIVE

This section aims to analyze the data to achieve the third objective of the research that is to recommend the most effective strategy which could be implemented to reduce the exposure towards the hazards. The data were obtained using quantitative method and the data were analyzed using SPSS software. The instrument used to obtain data is through distribution of questionnaire to respondents consisting of employees in the facility management related company from BMES Maintenance Services Sdn Bhd, Puncak PKF Resources Sdn Bhd and Wawasan Landscape Resources.

By using the instrument, the researcher was able to analyze the data that has been obtained in order to answer the third objective of the research which is to recommend the most effective strategy which could be implemented to reduce the exposure towards the hazards. The researcher uses the mean analysis to provide answer for the third objective. The mean is averaged by adding all the scores and dividing it by number of respondents. By utilizing the mean analysis, average value of each set of data will be produced. Analysis on mean average on each data of the effective strategy were identified. The other instrument that was been used was through Semi-structured interviews on the top level and middle level management of the respective organizations to support the findings of the data of the third objective and also to provide the most effective strategy that can be implemented in order to bring down the exposure towards the hazards.

Data analysis for Section D: To recommend the most effective strategy which could be implemented to reduce the exposure towards the hazards.

Generally, this section is being carried out in order to recommend the most effective strategy which could be implemented to reduce the exposure towards the hazards. Those are the few of the effective strategy that can be implemented in the workplace to diminish the exposure towards the hazards.

Table 5.3: Mean of effective strategy that can be implemented to reduce the exposure towards the hazards

ITEM	To recommend the most effective strategy which could be implemented to reduce their exposure towards the hazards.	N	MEAN
D1	Job intervals will help to reduce the fatigue and tiredness among the workers to perform the work safely.	60	4.05
D2	Safety briefing is necessary for the workers before starting the job.	60	4.12
D3	Tools and equipment should be inspected before usage.	60	4.13
D4	Management attention to common accidents and developing strategies helps to keep it from happening.	60	4.17
D5	Adequate training and continuous education enables the employees to be aware of the hazards at workplace.	60	4.15
D6	Proper lighting and good housekeeping practices can avoid unwanted accidents at workplace.	60	4.08
D7	Continuous monitoring on safety measures and up keeping of safety management system helps to manage workplace hazards effectively and minimize the chances of accidents occurrences.	60	4.22

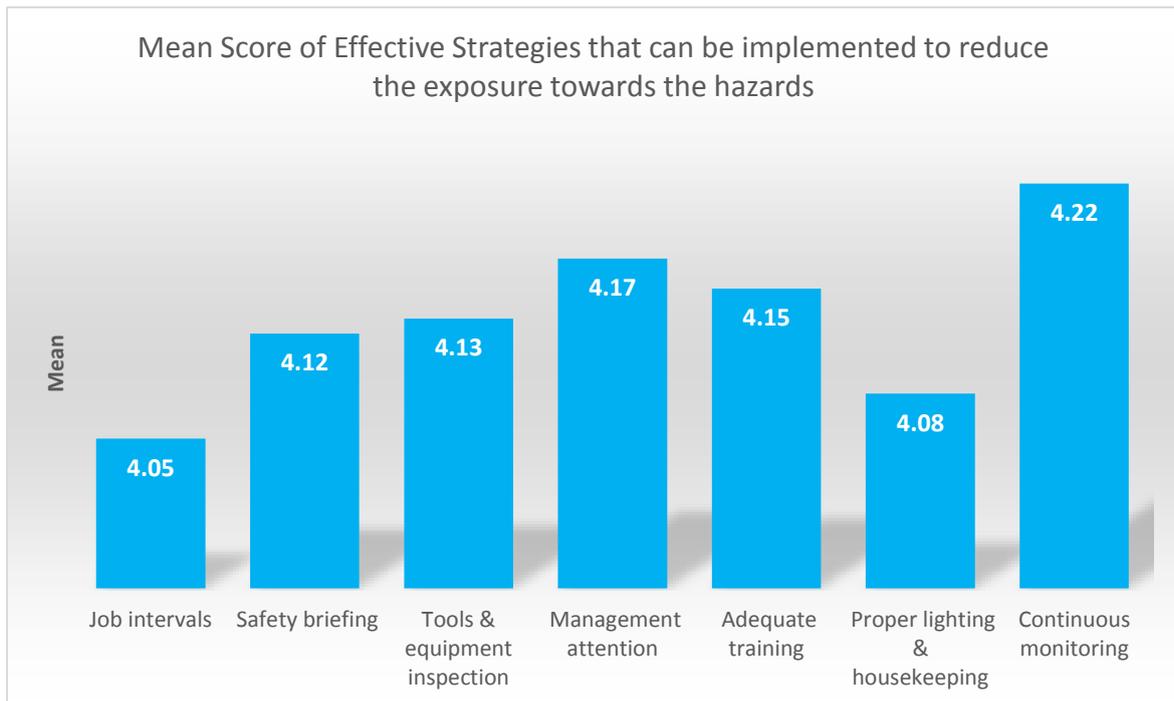


Figure 5.8: Mean Score of Effective Strategies that can be Implemented

Table 5.3 and figure 5.8 shows that mean score of effective strategy which could be implemented to reduce the exposure towards the hazards that has been obtained through SPSS software to analyze the data of the questionnaire. Likert scale were being used in this research which consist of scale 1 – 5 which are namely, scale 1 – strongly disagree, 2 – disagree, 3 – not sure, 4 – agree, 5 – strongly agree.

According to table 5.3 and figure 5.8, majority of the respondents agreed that continuous monitoring on safety measures and up-keeping safety management system therefore it received a mean score of 4.22, with 33.3% of the respondents strongly agreed, 56.7% of the respondents agreed, 8.3% of them were not sure, 1.7% disagree and none of the respondents answered strongly disagreed. Based on the analysis, it can be defined that continuous monitoring and regular safety level assessment helps to identify any vulnerable machinery or workplace so that necessary improvement and efficient remedy can be introduced to curb the hazards as an effort to reduce

the exposure towards a hazard.

Next, the management attention to common accidents gained a mean score of 4.17, with 45% of the respondents strongly agreed, 41.7% of the respondents agreed, 3.3% of them were not sure, 5% disagree and followed by another 5% of the respondents strongly disagreed. Based on the analysis, it shows that management of an organization should observe and take necessary safety measure and find out new ways of ensuring safe work environment and implement best workplace safety procedures to enhance and make improvement to things which need utmost recognition to reduce the exposure towards a hazard.

Other than that, Adequate training and continuous education obtained a mean score of 4.15, with 46.7% of the respondents strongly agreed, 36.7% of the respondents agreed, 5% of them were not sure, 8.3% disagree and followed by another 3.3% of the respondents strongly disagreed. The analysis indicates that relevant training and constantly educating the employees will enhance new skills and enables them to be updated with new knowledge that helps to improve the worker's awareness in order to minimize exposure towards the workplace hazards.

Apart from that, a mean score of 4.13 were been received for tools and equipment inspection hence 51.7% of the respondents strongly agreed, 31.7% of the respondents agreed, 1.7% of them were not sure, 8.3% disagree and followed by another 6.7% of the respondents strongly disagreed. The result of the analysis shows that, it is important to identifying the condition of the tools and equipment whether it safety to operated or need any adjustment or replacement is required so that early remedy for the issue were able to be carried out at initial stages because using defective or modified tools might cause exposure to a hazard or even resulting in risk to health and safety of workers.

In addition, safety briefing before starting a job achieved a mean score of 4.12, with 50% of the respondents strongly agreed, 33.3% of the

respondents agreed, 3.3% of them were not sure, 5% disagree and followed by another 8.3% of the respondents strongly disagreed. It can be justified that safety briefing are vital for a workplace in order to ensure health and safety always forefront in the minds of the workers and to make them realize about the risks and hazards that exist in their work activities to foster a good health and safe work culture.

Furthermore, proper lighting and good housekeeping obtained a mean score of 4.08, with 31.7% of the respondents strongly agreed, 51.7% of the respondents agreed, 10% of them were not sure, 6.7% disagree and none of the respondents answered strongly disagreed for this item. Based on the analysis, it is found that sufficient lighting and good housekeeping practices such as maintaining a safe work area and keeping access route free of clutter will helps to prevent unwanted injuries and reduces the chances of exposure towards a hazard in the workplace.

The lowest mean score among all other effective strategies were received by job intervals with 4.05 of mean score. Therefore, 45% of the respondents strongly agreed, 35% of the respondents agreed, 6.7% of them were not sure, 6.7% disagree and followed by another 6.7% of the respondents strongly disagreed for this item. According to the analysis, it clearly shows that job interval or breaks while carrying out a work is important for an employee because it helps to reduce the muscle strain and physiological stress among the worker hence they were able to perform the assigned duty in a safer manner without cause injuries to themselves or other staffs.

The inference that can be made based on the mean score that were be obtained to recommend the most effective strategy was found that majority of the respondents agree that continuous monitoring is the most suitable strategy that can be implemented to reduce the exposure towards the hazards in the workplace.

The implications from the results is that continuous monitoring is vital for an organization since any changes in work activity or the work environment will increase the risk and the chances of getting exposed towards the hazards (Park, et al., 2019). Sudden changes on work related activity, routine and surrounding environment will elevate the chances of uncertainty and require usage of additional tools, equipment or even changes the work method which impose other hazards which might be harmful to the workers.

The recommendation that can be made based on the findings and results on effective strategy, it shows that continuous monitoring is the most essential strategy that could be implemented in an organization. For the matter of fact, this item received the highest mean score compared to any other item in this section. This clearly shows that vast majority of the respondents agree that they recommend continuous monitoring as an effective strategy that can be implemented to reduce their exposure towards the hazards that are found in the workplace. Continuous monitoring by performing regular assessment on the safety level helps to ensure updated safety management system and also enables the management to take necessary safety measure which will increase the visibility and transparency as well as creates an awareness to curb the hazards which are profound in the maintenance works. There are multiple ways of monitoring that can be implemented such monitoring on worker's behavior, work method, tools and equipment monitoring.

The management should emphasis the use of appropriate resource and monitor the worker's behavior to ensure there were no misconduct in the workplace. This reason is, improper behavior can cause negative impacts to their work, environment or even jeopardize the safety of peers. Next, the management should emphasis safe work method to their employees and monitor and observe whether the employees follow the proper work method and making sure that no shortcut were been taken in order to reduce the impact of the hazards. On the other hand, the management of the organization could monitor and inspect the tools and equipment that were being used by their employees to assure that it is safe to be utilized. In

addition, the management should also monitor to see whether right tool for the right job to reduce the risk of the hazards. Therefore, continuous monitoring is the most effective strategy which could be recommended to reduce their exposure towards the hazards.

Data analysis for Semi-structured interviews: To recommend the most effective strategy which could be implemented to reduce the exposure towards the hazards.

The section of analysis was carried for the third objective which is to provide recommendation on the most effective strategies which could be implemented to reduce the exposure towards the hazards and to support the findings from the questionnaire data. The method that was been used by the researcher is through semi-structured interviews. Table 5.4 shows the profile of respondents which includes name, organization name and their designation.

Table 5.4: Respondent's profile

RESPONDENT	DESIGNATION
RESPONDENT 1	Facility Manager, BMES Maintenance Services, Sdn Bhd
RESPONDENT 2	Facility Engineer, BMES Maintenance Services, Sdn Bhd
RESPONDENT 3	CFMS Executive, BMES Maintenance Services, Sdn Bhd
RESPONDENT 4	Executive, Puncak PKF Resources Sdn Bhd
RESPONDENT 5	Executive, Wawasan Landscape Resources Sdn Bhd

Table 5.5: Interview responses

RESPONDENT	OBJECTIVES	RESPONSES
RESPONDENT 1	Objective one: To identify the types of workplace hazards which building maintenance personals are exposed to during their work.	Falling from high places are the most dangerous hazards which are found in the maintenance works. Other than that, slip, trip and fall can lead to minor injury and fracture.
	Objective two: To investigate the contributing factors which may cause accidents to happen when maintenance works are being carried out.	Lack of concentration while performing the job and skipping the standard operating procedures (SOP) will cause accidents to happen. Internal audits can be carried in terms of personal protective equipment (PPE) utilization and observe the work process and procedures.
	Objective three: To recommend the most effective strategy which could be implemented to reduce their exposure towards the hazards.	Analyze the accident frequency, perform case study on past accidents and make amendments on the work flow or work method to minimize the hazards. Review the risk assessments periodically and management should be committed in performing continuous monitoring towards zero accidents and incidents to curb the hazards.

RESPONDENT	OBJECTIVES	RESPONSES
RESPONDENT 2	Objective one: To identify the types of workplace hazards which building maintenance personals are exposed to during their work.	Tripping issues due to abnormal operations especially during wear and tear activities might end up in falling. Repetitive movement and abnormal body postures will cause Musculoskeletal diseases (MSD) due to prolong activities.
	Objective two: To investigate the contributing factors which may cause accidents to happen when maintenance works are being carried out.	Accidents are caused by poor maintenances of tools and equipment's, lack of knowledge about the job and unsafe act or behavior. Educate the work process to the team members about unsafe act and conditions, engage specialist to perform high risk works or in terms of work that require competency.
	Objective three: To recommend the most effective strategy which could be implemented to reduce their exposure towards the hazards.	Tool briefing need to be conducted on daily basis or for high risk work activities including explanation on behavior, usage of tools, appropriate PPE usage and hazards that exist in those activities. Schedule inspection and continuously monitor the workplace area to ensure good workspace for the employees.

RESPONDENT	OBJECTIVES	RESPONSES
RESPONDENT 3	Objective one: To identify the types of workplace hazards which building maintenance personals are exposed to during their work.	Working at height and electric shocks can cause utmost impact to one's health and safety because the severity of the hazards is very high.
	Objective two: To investigate the contributing factors which may cause accidents to happen when maintenance works are being carried out.	Performing a work in a hurry makes a person to fall due to imbalance body positions. Plan the work efficiently so that the job can be completed or perform without any rush.
	Objective three: To recommend the most effective strategy which could be implemented to reduce their exposure towards the hazards.	Up keeping safety management system and safety and health campaign will make workers to prioritize safety at workplace. Continuously inspect the workplace environment to find out unsafe acts and conditions and update workplace management system accordingly to latest ISO 45001:2018 standards.

RESPONDENT	OBJECTIVES	RESPONSES
RESPONDENT 4	Objective one: To identify the types of workplace hazards which building maintenance personals are exposed to during their work.	Slip, trip and fall from same level or falling from different level can cause severe injury and even cause a person to die from the impact of the fall. Heat will cause heat stress or heat stroke when perform a job in a hot and sunny day that will result in dehydration if works are carried out at outdoors.
	Objective two: To investigate the contributing factors which may cause accidents to happen when maintenance works are being carried out.	Poor PPE maintenance, lack of awareness regarding the workplace and wrong tools and equipment selection and defective tools will end up causing accidents to occur in workplace. Monitoring the worker's behavior to find out the unsafe act and attitude will reduce possibilities for accident occurrences.
	Objective three: To recommend the most effective strategy which could be implemented to reduce their exposure towards the hazards.	Provide refreshment on monthly basis and provide On-job training for new employees under to surveillance of experienced staffs to make them follow the right sequence of work process. Observe and monitor the worker and their surrounding environments constantly to make necessary safety measure and make improvisations to reduce their exposure towards the hazards.

RESPONDENT	OBJECTIVES	RESPONSES
RESPONDENT 5	Objective one: To identify the types of workplace hazards which building maintenance personals are exposed to during their work.	A person is highly vulnerable to fall from height will carrying out works which can cause serious injury. Next, electric shock will also can severe burn and might result in loss of life in case of high voltage.
	Objective two: To investigate the contributing factors which may cause accidents to happen when maintenance works are being carried out.	Neglecting the usage of PPE while performing the job and inappropriate work knowledge and experience can cause accidents to happen. Use hazard control hierarchy to manage these factors.
	Objective three: To recommend the most effective strategy which could be implemented to reduce their exposure towards the hazards.	Effective PPE selection and enhancing the engineering controls in workplace is one of the strategy to reduce the exposure towards the hazards in workplace. Handle comments, suggestion and complaints from the workers efficiently and hire other departments, third party or external OSH firms to review and audit workplace for continuous improvisation and monitor it in timely manner.

5.6 CONCLUSION

As to conclude this chapter, the results of the research were obtained through questionnaire and semi-structured interviews have been discussed and analyzed in this chapter. All survey question data were collected and analyzed using SPSS while the semi-structured interviews were described through analysis of response that was interviewed from the respondents. The data that were successfully collected to facilitate in processing and analyzing the data to achieve the objectives in this research. Therefore, the answers to the three objectives that is stated in chapter one is obtained.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 INTRODUCTION

This chapter will discuss and summarize the data analysis resulting from the acquisition of respondents to answer the three objectives of the research. Based on the analysis and discussion that has been done in chapter five, conclusions will be made in this chapter and recommendations will be submitted for further study and intended to serve as a reference for prospective researcher and to make further improvement from this point forward.

This chapter is also the final chapter in this research. All the detailed analysis is stated and summarized to achieve the three objectives. As a conclusion to this research, this chapter briefly describes the findings of the research question, the implications of the research, research limitations and suggestions for scope of further research to be used as a reference for future improvements.

6.2 SUMMARY OF RESEARCH QUESTION

The research is intended to find out what are the most prevalent physical hazards that occur during building maintenance works. The research objectives were as following below.

6.2.1 Research Question One

The objective of this research question is to identify the types of workplace hazards which building maintenance personals are exposed to during their works and that will be mainly focused on physical hazards since it is related to all work elements. Based on the analysis from the distribution of questionnaire and semi-structured interview sessions that were been carried out on three different maintenance related organizations, it was found that work at height were been identified as the most common and dangerous type of physical hazards that are found among the building maintenance workers. After the research were been conducted, it proves that work at height is the prevalent physical hazard that really need to be considered and taken cared in order to overcome the exposure while performing the job.

6.2.2 Research Question Two

The objective of this research questions is to investigate the contributing factors which may cause accidents to happen when maintenance works are being carried out. The researcher produced the questionnaire based on four constructs as the indicator for the items in the questionnaire. The second research question of this study has been stated in more detail manner in chapter five. The results of the data were analyzed using SPSS Software.

Overall for this second research question it can be concluded that most of the respondents agree and strongly agree that those which are related to all four constructs can cause accidents to happen however uncomfortable to personal protective equipment (PPE) received the highest mean score due to vast number or majority of the respondents agreed and strongly agreed to the particular item. Therefore, appropriate safety measure and effective safety managements should be imposed for time to time to ensure safe and healthy

workplace environment for the building maintenance personals.

6.2.3 Research Question Three

The objective of this research question is to recommend the most effective strategy which could be implemented to reduce their exposure towards the hazards. To achieve the third research question, the findings are discussed in chapter five are in the form of recommendations or suggestions to recognize the effective strategy to be implemented in the organization to diminish the vulnerability against the hazards that exist in the maintenance activities.

The method used in achieving the third objective is through detailed analysis of the responses from the questionnaire and semi-structured interview sessions with respondents from top level and middle level management that consist from three organizations such as BMES Maintenance Services Sdn Bhd, Puncak PKF Resources Sdn Bhd and Wawasan Landscape Resources Sdn Bhd. Based on analysis of findings, it shows that the most effective strategy that could be implemented is through continuous monitoring at the workplace.

Continuous monitoring could be made in terms of worker's behavior, work environment, work methods and observation on tools and equipment that were been used in the work activities. By doing so, it helps an organization to come up with continuous improvements which allows to take proactive and reactive approaches to mitigate the risks and hazards. Other than that, continuous monitoring and improvements encourage to solve problems that caused by the hazards and enables the management to take conscious towards the safety commitments to improvise its safety management systems.

6.3 RESEARCH IMPLICATIONS

Based on the acquisitions and findings from the analysis of this research, it exhibits multiple essential information that can be taken into account in order to make improvements to safety related elements. Based on the empirical evidence that has been discussed in detail in this research, the findings from the data analysis that has been conducted in the research has produced suggestions that can be used as a reference to manage or mitigate the hazards and even facilitate in developing contingency plan for crucial events or work activity.

Furthermore, not only suggestions were made but also some of the existing issues and workplace hazards were also been addressed which can be focused and overcome in the near future. The implications are that the management enables to focus and improvise in terms of obtaining new ways to solve safety related problem that arise while executing maintenance works. Hence, the organization able to preserve a safe and healthy workplace, retains quality of employees, operates more effectively and also increase turnover, quality and productivity for the business.

6.4 RESEARCH LIMITATIONS

This section discusses on the limitations that were present while conducting this research. It was unfortunate that this research had to be conducted during Covid-19 Pandemic. Hence, there were a series of misfortunes occurred. The following is a list of limitations that occurred while conducting this research:

1. Covid-19 Pandemic

This research requires many observations on human and workplace environment as it is mainly about hazards that exist in the workplace. Due to the Restricted Movement Control Order (RMCO), it was tough to conduct more interviews with top-level management to more data for analysis.

2. Questionnaire Distribution

Due to RMCO, questionnaire could not be distributed directly to the target respondents. Hence, questionnaire was distributed by using Google Form. If questionnaires were to be distributed directly, it would have helped to get more data from respondents regarding workplace hazards they regularly face.

3. Late Responses

It was quite a challenge to get the targeted samples, which were 60 responses due to distribution of questionnaire by using Google Forms. Fortunately, all 61 responses out of 70 were collected which makes the respond rate of 87.1% which is very good enough despite pandemic situation. Researcher had to follow up with the respondents that were involved and it was not as easy.

4. Interview

The interviews were conducted through the zoom meeting and it is even worse as it was even difficult to fix an appointment with the required personnel, as they were busy with the constant job rotation. It was difficult to get permission for the interviews as a few of the respondents were from other organizations.

Even so, the problems mentioned above do not interfere with the research discovery process since the problems was been handled professionally by the researchers. The respondents involved cooperated and assist the researcher to complete the study sample that has been determined by the respondents and reduce the researcher's difficulties. Therefore, overall of this study has achieved the set goals and objectives.

6.5 RECOMMENDATION AND SCOPE OF FURTHER STUDY

This research involves about prevalent physical hazards that occur during building maintenance works, factors that cause accidents and strategy that can be implemented to reduce the exposure. As analysis of data has been conducted, only four constructs were being mentioned in this research. Perhaps as a scope for further study, more constructs can be added to be analyzed.

Any opportunity and knowledge gaps which can contribute to new knowledge can be studied further and any weakness of this research could be used as a guide for similar research to be done. Other than that, this research is narrowed to building maintenance personnel. Conceptual framework can be expanded with more than four constructs. Future researches should focus more on other workplace hazards since this research focused mainly on physical hazards.

For example, future researchers can perform research study on hazards such as biological hazards, chemical hazards, safety hazards, ergonomic hazards and psychosocial hazards that are found among the workers and so on. This research can be expanded to a wider range of population sizes and samples. As challenging it would be, it would produce more data to be experimented and analyzed.

6.6 CONCLUSION

As to conclude, this research has been successfully completed because all the research questions constructed were answered perfectly. This research was started by identifying the types of workplace hazards which building maintenance personals are exposed to during their works. It was then followed by investigating the contributing factors which may cause accidents to happen when maintenance works are being carried out. Furthermore, the most effective strategy which could be implemented was been recommended to reduce the exposure towards the hazards. The findings of the research are based on the current situation and can be utilized by the managements of those organizations in these three selected locations.

Workplace hazards which is mainly focusing on physical hazards were identified and their implications were analyzed in detail. Suggestions to manage the implications of the hazards were also discussed in this research and hence it will be beneficial for the organizations to give attention to the related things for betterment. Finally, this research can be used as a guide to make appropriate decision based on their requirements and needs and also to maintain the company's performance to an optimum level.

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LAMPIRAN

Lampiran 1: Borang Soal Selidik



BORANG SOAL SELIDIK

**A STUDY ON WORKPLACE HAZARDS AMONG BUILDING
MAINTENANCE PERSONALS**

**IJAZAH SARJANA MUDA TEKNOLOGI PENGURUSAN FASILITI DENGAN
KEPUJIAN**

POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

Terima kasih kerana meluangkan masa untuk mengambil bahagian dalam kajian ini. Kerjasama anda dalam memberikan maklumat dengan menjawab soalan ini amat dihargai. Semua maklumat yang diberikan oleh responden adalah **SULIT** dan merupakan bagi tujuan penyelidikan sahaja.

FEEDBACK FORM

This questionnaire was used to survey the facility management companies regarding knowledge sharing regarding the workplace hazards among building maintenance personal.

All information provided is CONFIDENTIAL and is used for survey purposes only.

SECTION A

Demographic Details. *(Please ✓ tick in the appropriate space)

A1). Organization/Company name

BMES Maintenance Services Sdn Bhd	Puncak PKF Resources Sdn Bhd	Wawasan Landscape Resources Sdn Bhd

A2). Age

< 25 Years	26-40 Years	41-50 Years	51-60 Years

A3). Gender

Male	Female

A4). Position

Top Management	Middle Management	Operational/ Ground Staff

A5). Work experience

Less than 1 Year	1-2 Years	3-5 Years	5-10 Years	More than 10 Years

For sections B, C and D, please tick based on the scale below.

Strongly disagree	Disagree	Not sure	Agree	Strongly Agree
1	2	3	4	5

SECTION B: Identify the types of physical hazards which building maintenance personals are exposed to during their works.

ITEM	QUESTIONS	SCALE				
		1	2	3	4	5
B1	Does your work process involves working at height?					
B2	Have your ever experienced a slip, trip and fall while carrying out the work?					
B3	Do you work at a place that cause heavy sweating and exhaustion caused by the work environment?					
B4	Does your work involve exposure to excessive loud noise?					
B5	Does your work involve repetitive and awkward postures?					
B6	Do you frequently exposed to vibration from your tools and equipment while carrying out the work?					
B7	Do you ever encounter electrocution or electric shock while performing the work?					

SECTION C: To investigate the contributing factors which may cause accidents to happen when the maintenance works are being carried out.

ITEM	QUESTIONS	SCALE				
		1	2	3	4	5
C1	I perform repetitive hand and arm movement in my work process.					
C2	I often encounter fatigue and anxiety while carrying out the work.					
C3	I feel uncomfortable while wearing the personal protective equipment(PPE) while performing the work.					
C4	I feel tired and exhausted due to my job requirements which leads to fast work procedures.					
C5	I am exposed to severe noise level that cause me to raise my voice while speaking to others at my workplace.					
C6	I am exposed to heat that cause sweating at workplace even when I am not working.					
C7	I have exposed to defective/modified tools and equipment which might cause physical injuries at my workplace.					
C8	I have a workplace which has a good housekeeping practices and has sufficient lightings.					
C9	I am unaware of the potential hazards at my workplace.					
C10	I am aware of my work process and procedures.					

C11	I am provided with appropriate training by the management to perform the specified job at the workplace.					
C12	I am well aware about the organization's commitment towards safety practices.					
C13	I have been given limited time to perform the job which makes me to rush to complete my tasks.					
C14	I feel that effective job rotation helps employees to perform the job more effectively.					

SECTION D: To propose the most effective strategies which could be implemented to reduce the exposure towards the hazards.

ITEM	QUESTIONS	SCALE				
		1	2	3	4	5
D1	Job intervals will help to reduce the fatigue and tiredness among the workers to perform the work safely.					
D2	Safety briefing is necessary for the workers before starting the job.					
D3	Tools and equipment should be inspected before usage.					
D4	Management attention to common accidents and developing strategies helps to keep it from happening.					
D5	Adequate training and continuous education enables the employees to be aware of the hazards at workplace.					
D6	Proper lighting and good housekeeping practices can avoid unwanted accidents at workplace.					
D7	Continuous monitoring on safety measures and up keeping of safety management system helps to manage workplace hazards effectively and minimize the chances of accidents occurrences.					

LAMPIRAN

Lampiran 2: Soalan Temu Bual



TEMU BUAL

**A STUDY ON WORKPLACE HAZARDS AMONG BUILDING
MAINTENANCE PERSONALS**

**IJAZAH SARJANA MUDA TEKNOLOGI PENGURUSAN FASILITI DENGAN
KEPUJIAN**

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INTERVIEW QUESTIONS

1. What are the physical hazards that are found among building maintenance personals?

Apakah bahaya yang berkaitan dengan fizikal yang terdapat di kalangan pekerja penyelenggaraan bangunan?

2. Which of the following physical hazards often cause utmost health or safety effect and why?

Antara bahaya fizikal yang berikut, yang manakah sering menyebabkan kesan kesihatan dan keselamatan yang teruk dan kenapa?

- i. Work at height
- ii. Slip, trip & fall
- iii. Heat
- iv. Noise
- v. Repetitive & awkward posture
- vi. Vibration
- vii. Electricity

3. What are the contributing factors that cause accidents to happen?
Apakah faktor-faktor penyumbang yang menyebabkan kemalangan berlaku?

4. How to effectively manage those above factors?
Bagaimanakah cara untuk menguruskan faktor-faktor di atas dengan berkesan?

5. In your opinion, what are the most effective strategies that could be implemented to reduce the exposure towards the hazards?
Pada pendapat anda, apakah strategi yang paling efektif yang dapat dilaksanakan bagi mengurangkan pendedahan terhadap bahaya tersebut?

6. What is your suggestion to enhance and improvise the workplace safety & health management system to minimize the hazards?
Apakah cadangan anda untuk meningkatkan ataupun untuk menambahbaikan sistem pengurusan keselamatan dan kesihatan di tempat kerja untuk mengurangkan bahaya?