YANGON UNIVERSITY OF ECONOMICS

MASTER OF PUBLIC ADMINSTRATION PROGRAMME

A STUDY ON INDUSTRIAL SAFETY MANAGEMENT

IN YANGON INDUSTRIAL ZONES

(CASE STUDY: EASTERN DISTRICT INDUSTRIAL ZONES, YANGON)

THAN LWIN

EMPA-56 (16th Batch)

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A thesis submitted as a partial fulfillment towards the requirements for

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Supervised by   **Submitted by**

Dr. Su Su Myat   Than Lwin

Professor   Roll No. 56

Department of Applied Economics   EMPA (16th Batch)

Yangon University of Economics   (2017 - 2019)

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This is to certify that this thesis entitled **"A Study on Industrial Safety Management in Yangon Industrial Zones (A Case study In Eastern District Industrial Zones, Yangon)"** submitted as a partial fulfillment towards the requirements for the degree of Master of Public Administration has been accepted by the Board of Examiners.

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    Department of Applied Economics
    Yangon University of Economics   **(Examiner)**

December, 2019

ABSTRACT

A safety management system in developing or transition period, industrial zones can be important issues for any industry, no matter its size or what it produces. Constantly, evolving policies and laws make occupational health and safety increasingly important for every organization. This study is to identify the present condition of voluntary or government supervised industrial safety management activities of industries in Yangon industrial zones. This study is based on descriptive method using survey data. Most of the industrial enterprises have some safety elements such as policies, objectives, procedure, reporting and learning. Almost all of industrial enterprises realise that tripartite management activities are effective safety management activities not to occur any accidents in industries. Most of the employers used to provide some sort of safety facilities and ensure proper and constant maintenance of equipment and tools, proper guard of moveable and dangerous parts of machines A few amount of safety managers always organize pep talk and organize workplace safety meetings. Almost all of industries have and achieve the permits or licenses and also have being inspected and supervised annually by regulatory bodies which relevant to industrial safety such as Factories and General Labor Laws Inspection Department, Fire Services Department and Electrical Inspectorate. But some industrial enterprises do not have boiler licenses from Boiler Inspectorate although they had used boiler in their production process.

ACKNOWLEDGEMENTS

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AHEEERR	ASEAN Harmonised Electrical and Electronic Equipment Regulatory Regime
ANSI	American National Standard Institute
ASEAN	Association of Southeast Asian Nations
ASEAN-OSHNET	ASEAN Occupational Safety and Health Network
BI	Boiler Inspectroate
BS	British Standard
BSIS	Burma Standard for Industrial Classification
CSB	Chemical Safety Board
CSO	Central Statistical Organization
DISI	Directorate of Industrial Supervision and Inspection
DME	Durable Medical Equipment
ELCB	Earth Leakage Circuit Breaker
EI	Electrical Inspectorate
FGLLID	Factories and General Labor Laws Inspection Department
FSD	Fire Services Department
GFCI	Ground Fault Current Interrupter
HP	Horse Power
HSG	Health and Safety Guide
IEE	Institute of Electrical Engineers
ILO	International Labor Organization
ISIC	International Standard for Industrial Classification
ISM	Industrial Safety Management
ISO	International Standard Organization
JSC EEE	Joint Sectoral Committee Electrical and Electronic Equipment
LOTO	Lock Out Tag Out
NFPA	National Fire Protection Association
NOWL	Normal Operating Water Level
OHSAS	Occupational Health and Safety assessment Series
OHSMS	Occupational Health and Safety Management System

OHU	Occupational Health Unit
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PDCA	Plan-Do-Check-Act
PPE	Personnel Protective Equipment
RCD	Residual Current Device
SIA	Safety Institute of Australia
SME	Small and Medium Enterprise
SMM	Safety Management Manual
SOP	Standard Operating Procedure
US	United States
USD	United State Dollar
WHO	World Health Organization
YCDC	Yangon City Development Committee

CHAPTER 1
INTRODUCTION

1.1   Rationale of the Study

In Myanmar basic constitution 2008, article 24 has mentioned that "The Union shall enact laws to protect the rights of workers if necessary". Every citizen has right for a decent work and life that are appropriate for humanity.

A serious workplace injury or death changes lives forever, every person who leaves for work should expect to return home in good health. Value of life and health is the most important role not only in industrial sector but also any corporate although industrial sector is one for nation economic growth. Safety should be managed like any other corporate function as the key to effective line safety performance is management procedures that fix accountability.

Presently, safety processes are predominantly used in what are considered high-risk industries. Constantly evolving policies and laws make occupational health and safety increasingly important for every organization. Industrial Safety Management reduces risks to people, and processes both are usually ,merged. And the more we need development of industrial zones the more industrial safety management requires.

Istanbul Declaration, The Nineteenth World Congress on Safety and Health at Work on 11-15, 2011, affirmed that promoting the rights of workers to a safe and healthy working environment should be recognized as a fundamental human right and that building and promotion of a sustainable national prevention safety and health culture should be ensured through a system of defined rights (Hilgert, 2018).

Safety management is inherent to any manager's decision-making process, regardless of the source of risk, and safety is good business and good public policy. Relations in Industrial Safety Management are essentially the interactions and relationships as tripartite between employers, employees and the government, and the institutions and associations through which such interactions are mediated.

Seeing what can and has happened to people in industrial accidents is heart-wrenching and tends to bring out the altruism in fellow workers and leaders. A call to action that uses such rationale tends to reach the hearts as well as the minds. Although

safety management is expensive, dealing with accidents cost a lot of money and it can be not only in damage to [the] plant and in claims for injury, but also in the loss of the organization's reputation.

In Myanmar, recent information related in industries are for local government sector strongly needed to reduce injuries included: management commitment, employee involvement, communication, audits/ observations, goal-setting and strong safety culture according to local laws. Because the successful adoption of a safety management system relies a great deal on the level of commitment from both management and employees, as well as an adequate commitment of resources to design and enforce the system. Anyone, hoping to work in corporate leadership, should familiarize themselves with the development and implementation of safety management systems in industries.

1.2   Objective of the Study

The main objective of the study is to identify present condition of voluntary and government supervised industrial safety management activities of industries in Yangon industrial zones.

1.3   Method of Study

The primary data from survey questionnaires at least 150 industries in East District Industrial Zones are arranged according to 13 classifications of industries by using quantitative methods. A survey was randomly cluster sampled. Secondary data from safety related government's departments such as Factories and General Labor Laws Inspection Department (FGLLID), Boiler Inspection and Electrical Inspection Department, Directorate of Industrial Supervision and Inspection (DISI), Fire Services Department (FSD). And also literatures, safety books and pdf, web sites, law, rules and regulations and so on are referenced by using descriptive method.

1.4   Scope and Limitation of the Study

Particularly planning and implementing on the roles of industrial safety managements in the development of industrial zones in Yangon are studied. The survey questionnaires data collected during 15 August 2019 to 25 October 2019 by randomly cluster sampled and conducted in 150 industries in Eastern District Industrial Zones, Yangon. As for population, it include of 11 Industrial Zones. The total registered enterprises are 2456

in industrial Zones. The some limitations are difficult to get exact information from conducted survey data. Some of answer back may be better than in a real field condition. Many kinds and size of industries and classifications by products are greatly different in industrial zones and also quality of safety assessment can be differently affected between by local and by foreign investment industries. There are a lot of ministries correlated in industrial safety managements although in same safety goal. Specifically, some safety management system can be complicated according to their implemented theories and followed standards which they have trained.

1.5   Organization of the Study

This thesis is organized into five chapters. Chapter I provides an introduction of the thesis including rationale of the study, objectives of the study, method of the study, scope and limitation of the study and organization of the study. Chapter II reviews the literature relating to industrial safety management. Models and related safety management in industries are reviewed internationally. Chapter III describes about industrial zones briefly, national profile on safety management with the background and orient of departments relating safety on industry perspectives and also includes some safety instructions for industries. Chapter IV is expressed the survey analysis by the description method using survey data. The development and purposed for the thesis are discussed, registered industries in industrial zones are classified, distinguished the sizes and investments, and then exploring its suitability to address and to achieve the objective of the research. Chapter V concludes the results from the studies and in terms of the key research questions. Finding and recommendations as conclusion for industrial safety applications are presented.

CHAPTER 2
LITERATURE REVIEW

2.1   Industrial Safety Elements

A safety management system combines all the different elements in industrial workplace that need attention to ensure they provide a safe working environment for everyone who enters it. A number of topics and issues, affecting safety of personnel and the reliability of equipment in industry, are especially consisted in industrial safety. Safety management systems have six elements in common.

1. **A Safety Plan;** That is a strategic action plan that forms part of the business plan. A governance structure will be ensured by a safety plan within their business that guarantees every worker clear understands their safety obligations (the safety plan must a budget).

2. **Policies, Procedures and Processes;** Those include all safety set up within their industry/ company. This paperwork will describe all safety behavior, expectation, record-keeping, incident reporting, and incident notification documentations.

3. **Training and Induction;** Depending on the nature of their nature of industry (where it is low –risk or high-risk), as soon as everybody enter their workplace they must achieved training on the rules of the industry /company, the site and the location of their working. The level of risk, which is exposed to the person, will be depended on training content.

4. **Monitoring;** Industry's employee obligations to monitor their workplace depend on situation and demand, and to consider the level of risk ever. It is necessary, on other condition, to ensure that a new risk assessment has covered all risk that has been carried out due to a change in process.

5. **Supervision;** To have competent supervision is the only way to ensure employees safety obligations are being carried out. The supervision level necessitated in industry will increase if the safety control level put in place to decrease amount of risk is low down.

6. **Reporting; S**afety reporting at all levels, which are beyond the board level, is required in industrial enterprises of governance structure (Weekers, 2017). It mostly is a report compiled by a safety review officer after the completion of a

safety review. The source and archive of all information about the safe operation of the facility must be achieved by the safety report. A regulatory role as the primary documentary source for an approved assessor to verify that the facility will be run safely and the relevant executive summary of the safety report assessment supports the employer's licence application (Australia, 1994).

2.2   Safety Management Principles and Theories

Some of following common principles and theories aim to clarify accidents phenomena in industrial safety system and are models which try to explain the progression of events that finally produce the loss. One of the first industrial accidents causation theories was presented by H.W. Heinrich (1931). Heinrich's Domino theory proposed that certain factors could be thought of as being lined up sequentially like dominos. Heinrich proposed that an accident is one of five factors in a sequence that results in an injury. And five factors were social environment/ancestry, fault of the person, unsafe acts or unsafe condition, due to an accident and cause by an injury.

Heinrich (1931) said hat accidents could be prevented by removing one of the factors and so interrupting the knockdown effect. He focuses on the human factor, which he termed "Man Failure", as the cause of most accidents. Bird and Loftus present the Domino Theory first update (Bird & Germaine, 1985). In two new updated concepts, first is managerial errors and the influences, and the second is losses, as the result of an accident could be production losses, property damage or wastage of other assets, as well as injuries. These factors were lacking of control (Management) in instance refers to the four function of a manager which are planning, organizing, guiding and controlling, basic causes originally personal factors and/or job factors, causing immediately the primary of all incidents such as unsafe acts and unsafe condition, happening any incident which is an unnecessary event occurs and finally losing effect on people or property environment damage or injury to personnel.

According to Marcum's (1978) Seven Domino Sequence of Misactsidents, a misactsident is an identifiable sequence of misacts associated with inadequate task preparation leading to substandard performance and miscompensated risks. This theory focus on the human element of misacts which includes misacts of employees who fail to recognize or appreciate risks in the workplace, as well as misacts of management who permit risks to go unrecognized , unappreciated and /or

uncorrected. Marcum's theory focuses on management responsibility for protecting employee safety as well as preventing the downgrading of an organization which includes incurring losses to equipment and facilities and to intangible assets of the organization such as reputation or corporate goodwill (Friend & Kohn 2007). Accident causations are expressed in several domino theories but all domino theories are divided into three phases in common. Firstly, events or conditions which are able to occur the accident are befallen unfortunately as pre-contact phase. And then the phase comes into contact with the energy forms or forces beyond their physical capability to manage. Finally, post-contact phase (injury/death/damage/harm effect) are happened which causes energy exposure or the accident as a result.

According to Peterson (1978), behind every accident there lie many contribution factors, causes and sub-causes. The multiple causation theory is that these factors combine together, in random fashion, causing accidents.In human factors theory, the factors that cause human errors are overloading. Overload occur when a person is burdened with or responsibilities. For example, the employee not only must perform his or her job, but must also handle excessive noise, stress, personal problems, and unclear instructions. And inappropriate activities when individuals undertaken a task without proper training, they are acting inappropriately. Finally inappropriate response occurs, for example, when an employee detects a hazardous condition but does not correct it, or removes a safeguard from a machine to increase productivity.

The distinctions between the hands on 'operator' errors and those made by other aspects of the organization have been described by Reason (1990) as 'active' and 'latent' failures. Active failures have an immediate consequence and are usually made by front-line people such as control room and machine operators in industry. Latent failures are those aspects of the organization which can immediately predispose active failures. Reason model is known as 'Swiss Cheese Model'. Reason (1990) had a major impact on OHS thinking and accident causation in that he moved the focus of investigations from blaming the individual to a no-blame investigation approach; from a person approach to a system approach; from active to latent error; and he focused on hazards, defenses and losses. Many accident causation models/theories have been dominating the human factors literature from a range of viewpoints and in a variety of different industrial contexts and many of theories/models have limited applications with respect to capturing the underlying accident causations in modern complex

systems (Lee, Choi, Ma, &Mathew.2015). Above all are just on basic theory concepts and for some accidents, a given model may be very accurate, for others less so. .Thus actual cause may combine parts of several different models and there still has to consider many more models like epidemiological theory, combination theory, modern causation model, seven avenues models, safety management systems and so on .

2.3   Industrial Safety Management(ISM)

Industrial safety management is all the steps taken by employers, employees, safety officers, supervisors, and government to ensure safe work or production process in industries which main objectives to promote safety,4 practices (planning, organizing, coordinating, and controlling) among employers and employees and to reduce and eliminate risk in industries(Igberadja & Serumu,2012).

Industrial safety is refers to the management of all operations and events within an industry in order to protect its employees and assets by minimizing hazards, risks, accidents, and near misses. Industrial safety is overseen by federal, state, and local laws and regulation (https://www.safeopedia>definition).   Industrial safety is the study and/or implementation of principals intended to recognize hazards and prevent accidents in work-related situations (Vincoli, 2000). Specific occupational safety and health risk factors vary depending on the specific sector and industry. Industrial safety is primarily a management activity which is concerned with reducing, controlling and eliminating hazards from the industries or industrial units. Safety is opposite to accidents and the maintenance of safety has become a major program in the industries (Jose, Sijo, & Praveen, 2013).

2.3.1   Safety Climate and Culture

Safety climate is defined as "the sum of employees' shared perceptions of policies, procedures and practices relating to safety in their work environment" (Zohar, 1980). Safety climate is an organizational factor commonly cited as a predictor of injury occurrence (Huang, Smith, &Chen, 2006). Safety culture refers to "the attitudes, beliefs, and perceptions shared by natural groups as defining norms and values , which determine how they react in relation to risks and risk control system"(Hale,2000).It can be used to refer to the behavioral aspects, i.e. what people do and situational aspects.

Safety culture remains a confusing and ambiguous concept in industry. Workplace safety may be better served by shifting from a focus on changing safety culture to changing organizational and management practices that have an immediate and direct impact on risk control in the workplace (Borys, 2014).

In safety management fundamental, organizational culture has the potential to affect interactions between industry and regulatory authority personnel or between senior and junior members of a group. Culture effects internally and with the regulatory authorities sharing information degree and prevalence of teamwork in the regulatory authority or industry organization. Safety culture in industrial organization must include efficient reactions of personnel under demanding operational conditions and easy transformation of the acceptance and utilization of particular technologies (ICAO,2013).

2.3.3 A Workplace Injury Cost

The average number of work days lost to secondary to work injuries was nine days and Sprains/strains accounted for 40% of the injuries. A work – related injury resulted in an average loss of approximate $38,000 including wages, productivity loss and medical expenses (http//www.nsc.org/Pages/Home.aspx).

The direct costs of an injury are the easiest to see and understand. But direct costs are just the tip of the iceberg. What has changed in the past few years is that risk managers and corporations are now thinking about health/safety and injury prevention and their collective recognition of the important of the indirect costs of injuries and illness. Indirect cost multipliers for work related injuries range from 3 to 10 times as direct cost (R. Gagne, 2011).Direct costs associated with a work related injury may include worker's compensation premiums, case Management, medical costs for surgery, medicine and rehabilitation and DME or ancillary aids. Indirect costs associated with a work related injury may include lost /decreased productivity, time to go to medical appointments, production down time, administrative costs, additional overtime pay required, Delays in shipments and filling orders and so on.

Trevor Kletz, who is founding father of inherent safety, said that "Safety is good business and good public policy. There's an old saying that if you think it is expensive, try an accident. Accidents cost a lot of money. And it is not only in damage to (the) plant and in claims for injury, but also in the loss of the company's reputation" (Chemical Safety and Hazard Investigation Board, 2013).

2.4 ASEAN Guidelines for Occupational Safety and Health

That guideline has been developed to assist employers/owners/managers of industries manage OHS in their work. An OHSMS is a coordinated and systematic approach to managing safety and health risks and it helps organizations to continually improve their safety performance and compliance to safety and health legislation and standard.

Management system usually follows a "Plan –do - check –act" model or stood on "improvement cycle" where the organization sets up an OSH-target , plan how to reach the target, execute the plans, check the results and act on deviations. It requires a comprehensive and systematic process for the ongoing identification and assessment of work place hazards/risks, and implementing control measures to eliminate or mitigate these hazards/risks.

OHSMS is arranged using the PDCA approach which is also common to other management system and its operation process is as follows:

1. **Plan**-Identify the key requirements and establish OHS plan, responsibility and operation
2. **Do**-Implement OHS plan, execution
3. **Check**-Measure and compare result of the program against expected results, monitoring, checking and auditing
4. **Act**- Analyse   the differences to decide their cause. Then, determine where to appropriate changes or improvements, improving, correcting and evaluation.

The PDCA approach provides an overall framework for managing preventive and protective measures, emergence preparedness, training, procurement issues, documentation, legal and many other safety-related requirements.

An OHSMS is a coordinated and systematic approach to managing safety and health risks and it helps organizations to continually improve their safety performance and compliance to safety and health legislation and standard.

2.4.1 Risk Assessment and Management

OSH Management Systems are based on standards, which specify a process of achieving continuously improved OSH performance. The person who is responsible for ISM in industry should know some terms. A combination of the likelihood of an occurrence of a hazardous event and the severity of injury or damage to the health of people are caused by this event. The inherent potential is to cause injury or harm to

people's health. It can cause loss to people (injury), equipment (breakage) and property (fire). Risk assessment is the process of evaluating the risks to safety and health arising from hazards at work. And otherwise it is a process of determine the likelihood and severity of the accidents/events so that the intensity of the hazard can be determine and prioritized. Hazard identification is the process of identifying hazards in the workplace or for a work procedure. Workplace hazards can be divided into six groups:

1. Physical hazard such as noise, electricity, heat cold
2. Chemical hazards such as toxic gases, noxious fumes and corrosive liquids
3. Ergonomic hazards such as the height of a workbench, the shape of a vehicle seat and the length of a control lever
4. Radiation hazards, for example, from x-ray radiation machines, high powered lasers, radioactive materials
5. Psychological hazards such as stress from using equipment without proper training of instructions, overwork, or being coerced into using faulty equipment which carries a risk of injury and
6. Biological hazards such as syringes containing potentially infect blood, specimen containers carrying potentially infected materials and Legionella bacteria and viruses from air conditioning systems.

2.4.2 Assessment of Risks

Risk assessment is the process of assessing all of the risks associated with each of the hazards identified during the hazard identification process. In assessing the risks, three essential steps are taken such as evaluating the probability or likelihood of an incident occurring and calculating or estimating of the severity of the potential consequences. Based on these two factors, the risks are assessed through the use of a risk rating. Risk assessment involves examining and evaluating the likelihood and severity (or consequence) of the potential outcomes in order to prioritize risks for control.

Table (2.1)   Likelihood of a hazardous event or situation

Descriptor	Description
Remote	Not likely to occur
Occasional	Possible or known to occur

Frequent	Common or repeating occurrence

Source- ASEAN Guidelines for Occupational Safety and Health, 2013

Likelihood, which is probabilities of occurrences, show how likely it is that a hazardous event or situation will occur. If any hazard occur the chances are the most likely safety mishap will occur to put it another way. There should create criteria to define likelihood of the risk and it can be divided into three situations such as remote, occasional and frequent as shown in above table.

Table (2.2)   Severity on the Consequence of a Hazardous Event or Situation

Descriptor	Example detail Description
Minor	No injury, injury or ill-health requiring first aid treatment only (includes minor cuts and bruises, irritation, ill-health with temporary discomfort
Moderate	Injury requiring medical treatment or ill-health leading to disability (includes lacerations, burns, sprains, minor fractures, dermatitis, deafness)
Major	Fatal, serious injury or life- threatening occupational disease (includes amputations, major fractures, multiple injuries, occupational cancer, acute poisoning and fatal diseases)

Source- ASEAN Guidelines for Occupational Safety and Health, 2013

Severity express how serious could the harm to people and properties and that can estimate how serious the injury or illness could be using a scale of major, moderate or minor. It can also describe highest level of damage possible, which gives multiple modes of justification for each risk assessment, when accident occurs as shown in following table.

Table (2.3)   Degree of Risk

likelihood			
Frequent	Medium risk	High risk	Extreme risk
Occasional	Low risk	Medium risk	High risk

Remote	Low risk	Low risk	Medium risk
What is the chance it will happen?	Minor	Moderate	Major

Severity →

Source- ASEAN Guidelines for Occupational Safety and Health, 2013

Risk states that are uncertainties as the result of an event when possibilities offer only the chance of a loss. The process of prediction for the degree of risk must be accurate by coordination of likelihood and severity in following matrix. There might be low risk, medium risk, high risk and extreme risk. The reducing of failure and uncertainty in leading goals of industrial organization can be managed by accurate prediction of above matrix.

2.4.3   Risk Assessment Outcome

The result of risk matrix is compared with the criteria defined below.

1. **Extreme Risk;** For new machinery or process, work should not be begun until the risk has been mitigated. If it is not possible to mitigate even with limited resources for ongoing process, work should not be continued until the risk has been mitigated. Immediate action required; notify supervisor or safety personal. If possible, the activity should be ceased immediately.

2. **High Risk;** Work should not be begun until the risk has been diminished. Significant resources may have to be located to mitigate risk. Where risk involves work in progress, urgent action should be taken. Notify supervisor and safety and health representative and Implement immediate action to minimize injury.

3. **Medium Risk;** Effort should be made to mitigate the risk. Risk should be tolerated for a short term. Implement immediate action to minimize injury. Remedial action required within five working days.

4. **Low Risk;** Largely acceptable, subject to reviews periodically or after significant changes. Remedial action within one month (if possible), supervisor attention required.

5. **Risk Control;** Risk control provides a means by which risks can be systematically evaluated against a set of control options (the hierarchy of

controls) to determine the most effective control method(s) for the risk(s) associated with each hazard. This process involves analysing the data collected during the hazard identification and risk assessment processes, and developing a strategic plan to control the risks identified.

The hierarchies of control are eliminating the hazard, substituting with a lesser hazard to reducing hazard by using engineering controls, administrative controls such as workplace procedures, and using and wearing appropriate Personal Protective Equipment.

2.5   Personnel Responsibilities in Industrial safety Management

It is important that responsibilities for safety should be identified and allocated properly in clear and logical way. Each member of the relevant industrial undertaking to which the responsibilities are allocated should know what he is responsible for and to whom he is responsible regarding safety and health matters (Weekers, 2017). ISM is all the steps taken by employers, employees, safety officers, supervisors, and government to ensure safe work or production process on industries which main objectives is to promote safety, practice among employers and employees and reduce and eliminate risk in industries. In the industries, three main personnel are involved in the process.

The employer (owner of the company) has various responsibilities for effective ISM in order to prevent the occurrence of accident. Some of the responsibilities for workers or visitors include provision of a safe work environment, provision of Personnel Protective Equipment (PPE), the required facilities and machines for production, safety training, ensuring proper and constant maintenance of equipments and tools used during production, first aid facilities in the company, ensuring proper guard of moveable and dangerous parts of machines in the company and enforcing strictly safety rules and regulations.

The responsibilities of employees with respect to ISM include wearing PPE (such as safety shoe, hard hat, hand gloves, eye goggles), keeping their work environment clean and arrange tools properly, always adhering to the safety rules and regulations of the company, reporting to the supervisor when they noticed that the equipment and tools they are using is not safe for job, do not using equipment and tools for another job outside what they are meant for, do not eating while working in the plant and employees should reporting every accident to their supervisor and so on.

A robust safety management system can help managers to diminish loss through incident prevention. The responsibilities of supervisor as the foreman in the company are ensuring that before the days job begins every workers have being brief on the days jobs during pep talk and all hazard associated with the task are identified, making sure that all the equipment tools for the day's job are in safe condition for used, performing the task according to recommended procedures, informing the management of the state of workers, equipment and tools and making sure that workers used the recommend materials and proportion during production.(Igberadja, & Serumu , 2016)

In some industry, there is appointed a safety officer who is an employee in an industry that is charged with the responsibilities of preventing accident. His responsibilities are induction of all persons on site, ensuring adequate security on site, talking organized pep before the day's job begins, organizing safety meeting, and recording site safety statistics in safety statistics board. The safety officer will correct unsafe acts or condition through the regular line of authority, although the safety officer may exercise emergency authority to prevent or stop unsafe acts when immediate action is required. Only one safety officer will be assigned for each incident and may have assistants as necessary. The safety officer maintains awareness of active and developing situations, ensures the site safety and health plan is prepared and implemented and ensures there are safety messages in each Incident Action Plan (https//www. aiha.org/get-involved/).

2.6   Industrial safety Management Experience in India

The ILO and WHO indicate that overall occupational accident and disease rates are slowly declining in most industrialized countries but are level or increasing in developing and industrializing countries. In India the rates of occupational fatalities accidents are 10 .4 and 10.5 per 100,000 for fatalities, 8,700 and 8,028 for accidents (Alli, 2008). The history of safety management in India is very much linked with the history of industrialization in the country. Consequent of many industrial developments, the need to ensure safety for men and materials in certain sectors of economic activity in India arose.

In the last decade of the 19th century, the advent of electricity caused to be a new situation in the factories; safety and health situation in industries were, in fact, in a very bad shape in India. For over a period of 50 years several amendments in the

Factories Act 1948 have strengthened the safety and health provisions in the factories. Every day, 47 factory workers are injures and three die in accidents. Data from the Labor and Employment Ministry in India reveal that in three years (2014-2016), 3,562 workers lost their lives while 51,124 were injured in accidents that occurred in factories (Jadhav,2019).

2.6.1 The Roles of Safety in India

The Safety legislation discloses the role of certain forces in harnessing the cause of safety in India. Management is found to be proactive about safety whenever they realize that higher cost of premature replacement of equipment damaged or destroyed by accidents, prohibiting direct or indirect cost of compensation due to fatal or even nonfatal accident and severe penalty awarded for noncompliance is less economical than the investment on safety and health. With the present compulsion to obtain ISO certification which requires integration of occupational safety and health with quality and productivity, management finds that OSH do make a good business sense.

In most cases, significant advances in safety have taken place through legislative intervention. The legal system constitutes the measures by which the political intent of the voter or citizens can shape the components of man-machine-environment systems. Safety Legislation, to a vast extent, is engaged in an examination of the actual state of affairs within man-machine-environment system to determine whether and to what extent modern technology. It must determine as a reflection of the basic political decision as well, whether and to what extent modern technology can be accepted by law. Political influences operate at three levels. At the first level, grass-root level workers and electors put pressures on the representatives of the parliament to make laws in order to provide protection against perceived occupational hazards. At the second level, an event or incident can occur whose result is so traumatic that the nation and parliament is shaken up and get into action. At the third level, the ruling party, with an eye on political expediency may decide to introduce legislation that will increase its standing as a political party among marginal groups of voters.

The legislative intervention is preceded by the union activism. Union influence has been exerted not only in direct negotiations but also through financing or supporting safety and health research, lobbying for OSH legislation and supporting

liability suits filed by union members. Technology has played a vital role in creating a need for extensive and dynamic safety program. Scientists and engineers have been continuously developing new equipment and process both for manufacturing as well as for protecting the workers from hazardous work environment. For doing the job efficiently and safely, it is vital that employees are given systematic training. The purpose of the training is to educate employees about the correct way of doing the jobs. When such training is imparted, care is taken to produce goods or services ensuring quality, safety, customer delight and minimizing damage or loss of any kind. Historically, in the early stage of legislation, the onus of responsibility for remaining safe at work was thrust on those who operated the machinery. In the middle of the 20th century the onus shifted from the worker to the occupier is in the position of control of what is being done and how it is being done (https: //shodhganga. inflibnet.ac. in/bitstream).

2.6.2   Methods of Developing Industrial Safety Programme in Industries

In developing an effective industrial safety programme in an industry, the several steps should be taken which are studying cases of industrial accident of similar industries producing same services, studying past accidents in their industry, identifying the various hazard and methods of eliminating associated in the production process of their company,. Company need to invite HSE specialist to come and study the potential hazard associated in the production process and then appraise the safety skills of employees in the company. Before a safety committee to develop a safety programme based on these information there have to present all the information gather. Other steps to fulfillment of safety programme are organizing training workshop for workers base on the safety programme developed by the safety committee, appraising the safety skills of the workers and repeating the entire step again due to technological change.

Industrial Safety Management is very crucial to the continued existence of any industry. This is because when accident occurs often in an industry, such as can fold up. Hence, it is paramount for every industry to have a good industrial safety management programme in order to prevent accident. (Igberadja & Serumu, 2012).

2.7   Reviews on Previous Studies

In 2012, researcher Ohnmar Kyaw analysed on a total of 150 randomly selected women workers of garment factories in Hlaing Thar Yar Industrial Zone. The conclusions drown in her research, it was approved that many women workers of garment factories have negative effects that the prime factors contribution to the hazardous health of women workers such as long working hours, lack of occupational safety and health related risks and in-adequate weekly holidays.

In Aung Kyaw Thet (2017) research resulted many issues about safety management in construction industries. He surveyed on the construed high rise building (above 9 storeyed) and the sample sides used for questionnaires are 279. He found that most of employers in construction industries are low knowledge in safety management. They organized safety management with few members and budget, so the teams cannot manage and control effectively and later it becomes reduction efficient. They have also weak to provide safety rules and policy, information and technological, and training / refresher training for staff and miss to send staff to attend the safety courses regularly. And also there have no sufficient safety signs and signal boards for occupational hazards and no risk management. There have no accident record and first aid kits in all companies.

According to his research, most of the safety managers/officers in construction industries have lack of knowledge and experience on PPE by using at workplace. They are weak to follow both the rules and policy. Most of the workers are low in safety knowledge and they favor their emotional intension than to save their lives. Young workers (under) tend to feel immune to hazards and do not take PPE. Their habitually actions are horse play each other. It tends to unsafe act by missing and neglecting instructions, procedures and discipline.

CHAPTER 3

OVERVIEWS OF INDUSTRIAL SAFETY MANAGEMENT IN YANGON INDUSTRIAL ZONES

3.1   Profile of Industrial Zones in Myanmar

Industrialization is an essential element of the whole development of a country. With a total land area of 676,578 sq.Km, Myanmar is the largest country in mainland Southeast Asia. During the socialist period in particular, inward-looking growth strategy, nationalization and import substitution had long been pursued. However, Myanmar's centrally planned economy faced many obstacles and stagnant growth in not only industrial sector but also the whole economy. Since the military government took over power in 1988, it abandoned a socialist central- planned economic system headed for a market –oriented one with a series of liberalization and deregulation measures implemented (Kudo,2001).

An inherent part of this transformation is the goal of industrialization as stipulated in the Private Industrial Enterprise Law of 1990 and the State Law and Order Restoration Council government began establishing industrial zones in the mid-1990. The objectives for creating the zones are threefold: to generate employment, expedite the process of industrialization, and increase the efficiency and competitiveness with which the industrial sector operates (Robertson, & Taung, 2015)

Currently, Myanmar has 63 industrial zones and parks in operation, occupying 25,425 of land in all the states and regions, with the exception of Chin State. Of all the industrial estates, 65 percent are located in the Yangon Region .

The number of industrial zones has increased over the years in Myanmar. Over 80% of the total industrial estate land is located in the two major commercial regions: Yangon and Mandalay. There are currently over 29 industrial zones in Yangon. The largest of these is Hlaing Tharyar industrial zone, where around 300,000 people work in more than 700 factories. Industrial zones in Yangon Region benefit from geographical proximity, and hence many better- run zones are being filled up. The Yangon Region Government has earmarked 11 townships in which an industrial zone can be constructed.

There are many industrial businesses operating outside the zones. It is not illegal for industrial business to operate outside the industrial zones, because there is

no written law that forced them into the zones. There are currently three designated SEZs with Thilawa SEZ being only active one, partly due to its proximity to Yangon. Yangon Region divided by four districts including 45 townships having (29) industrial Zones .The industrial zones in Yangon Region are Yangon East District Industrial Zone, Yangon West District Industrial Zone, Yangon South District Industrial Zone and Yangon North District Industrial Zone. The figure updated of Industrial Zones in Yangon can be seen in appendix (1).

There were 7243 private industrial enterprises are registered under DISI Yangon Region on 30, April, 2019. Private industrial enterprise means the conducting of an industrial enterprise either individually or in partnership or by forming a company. The categories of private industrial enterprises can be seen in appendix (2). The most registered private industrial enterprises were Food and Beverages Industries, totally 2368 industries and 32.69% of all industries were registered including 1045 large industries, 564 medium industries and 759 small industries. The least registered private industrial enterprises were Agriculture Machinery Industries, only 10 industries and 0.14 % of all industries were registered. According to DISI Yangon Region, total investment and production of industrial Zones in Yangon Region were (5171958.271) million Kyats plus (1304.063) million USD and (9767255.628) million Kyats plus (2783.666) million USD and 598459 workers are working in industrial zones. The table of registered Industrial enterprise in Yangon can be seen in appendix (3).

According to the currently industrial classification by Ministry of Industry, all economic activities are classified into 13sectors in industries. These are Food and Beverages, Clothing and Wearing Apparel, Construction Materials, Personal goods, Consumer goods, Literature and Art, Raw Goods Production, Metal and Mineral Production, Agriculture Machinery, Industrial Tools and Equipment Production, Automobile Production, Electrical Equipment, and General. As for investment of industries there should be local, foreign and joint venture. Size of industries such as heavy industry, median industry and small industry are provided and specified according to their parameters or specifications in Industrial registration Permit by DISI, Ministry of Industry.

Yangon Eastern District include (14) cities and 11 Industrial Zones. The total registered industries are 2799 industries including 2456 in industries Zones and 343 in non-industrial zones. 99526 workers are working in 11 industrial zones and total investment and production of Yangon Eastern District Zone are (1,793,234.874)

million Kyats plus (116.248) million USD and (3,954,413.051) million Kyats plus (372.956) million USD. The Total consumption power is (351,228.36) HP. The aggregate area of industrial zones is 3083 acres in which Dagon Seikkan (1, 2) Zone is widest zone occupying 1209 acres. Each zone is administrated by Industrial Zone Management Committee and Y.C.D.C also administrated in North Dagon Industrial Zone.

3.2 Public Agencies and   Followed Standards on Safety Management

In Myanmar basic constitution 2008, article 24 has mentioned that "The Union shall enact laws to protect the rights of workers if necessary". Every citizen has right for a decent work and life that are appropriate for humanity. A decent work can be defined as a work that as accommodate humanity and allows the workers to perform their work on a safe and healthy condition. It is not merely the keep away from accidents and work related diseases, but also should provide protection that guarantees the physical and mental wealthiest. Important role of industrial safety and health in the national development effort is well recognized by the government to improvement the standard of Industrial safety and Health in this country.

There are many Public Agencies responsible for protection of Occupational Safety and Health of the workers and improvement of working conditions as follows;

1. Factories and General Labor Laws Inspection Department (FGLLID) under of Ministry of Labor, Immigration and Population

2. Boiler Inspection and Electrical Inspection Department, Directorate of Industrial Supervision and Inspection (DISI), Ministry of Industry.

3. Occupational Health Unit (OHU), Department of Public Health , Ministry of Health and Sports

4. Ministry of Construction

5. Planning and Inspection Department, Ministry of Natural Resources and Environmental Conservation

6. Yangon City Development Committee (YCDC)

7. Myanmar Agriculture Service, Ministry of Agriculture and Irrigation

8. Fire Services Department(FSD), Ministry of Home Affairs

Another observation relating to OSH is that Myanmar has been participating in the activities of the ASEAN Occupational Safety and Health Network (ASEAN-OSHNET) since 2000.

Myanmar OSH Inspectors and Training centers follow not only current OSH framework in Myanmar but also some OSH framework and standards in the world. Some internationally recognized specifications for OSH management system are as follow.

1. OHSAS 18001 - Internationally recognized assessment specification for occupational health and safety management systems
2. ILO-OSH 2001- Guidelines a on Occupational Safety and Health Management Systems(ILO)
3. HSG 65 - Managing for Health and Safety (Guide)
4. BS 8800 - Occupational health and safety management systems Guide(British Standard)
5. ANSI Z 10 - American National Standard for Management Systems in Occupational Safety and Health
6. ISO 9000 Series - International standards on quality management (and quality assurance)
7. ISO 14001 Series - Environmental Management Systems

3.3 National Safety Authorities and Instructions

The OHS framework in Myanmar is embodied in the Factories Act of 1951 and Oilfield (Labor and Welfare) Act of 1951. The primary OSH regulator is the FGLLID and also essential departments for industrial safety are DISI, FSD and OHU.

According to the section 53 of Factories Act 1951, the manager or occupier obliges to report any accident resulting death or any bodily injury happened arising out of or in factories and industrial establishment, not including construction and commuting accidents. Factories Act 1951 in Myanmar provided some instruction for safe working in industries. The following are some instruction notes about Worksite Safety and Health Measures from Factories Act 1951 for any industries in Myanmar. The factory must be kept clean and the workspace must be situated away from drains, latrines or other things which create a bad or unhealthy smell. There must be proper ventilation, light and heat, no dust or smoke in the hall or factory. Population of workers must not be dense and there must be sufficient light. The latrines must be in suitable places. As for electrical safety, generators and other auxiliary units must be kept undercover. There must be arrangements made for any emergency cut out of electricity service. In weaving or spinning machines, any female workers and any

children must not be allowed to handle. In every factory, the arrangement of escape routes and fire alarms must be kept.

For the sake of welfare of employees in Factories Act 1951, some instructions of the occupational health are that must be washing and cleaning facilities for workers, sufficient seats for workers if a chance is given for sitting and sufficient First Aid Boxes. Doctors or nurses in clinic are to be appointed if the factories have exceeding 250 workers, At the present, FGLLID, together with other safety authorities, are promoting safety knowledge sharing seminars supported by ILO ensuring to be effective and well integrated tripartite relevant in safety which participation of employers, employees, and government.

3.3.1 Industrial Boiler Safety

Boiler means any closed pressure vessels in which steam is generated by heat for external use and any mounting or fitting attached to such pressure vessel. In this expression, any pressure vessel of less than 25 liters or 5.5 gallons capacity or less than one kilogram per square centimeter or 14.2 pounds per square inch and any mounting or other fitting attached to such pressure vessel are not include.

The Boiler Inspection Department (BI) is the service rendering organization under DISI. The Boiler Law was enacted in 14 July, 2015 (Pyidaungsu Huttaw Law No. 39/2015) to replace the Boiler Law 1948. The Boiler Inspection Department inspects all boilers in the whole country in accordance with the law of 2015 and International Boiler Standards on yearly basis. Over 2300 boilers are now in use various industries in Myanmar.

BI Department conducts boiler operator training course and advanced course to prevent accidents explosion, damages of boilers and loss of life and property due to the lack of technical knowledge. BI Department's main objectives are to preventing explosions, accidents, damages of boilers and loss of life and property, using with full capacity by efficient use of fuel energy, being able to use the boilers for maximum span of life and to reduce the impact on natural social health environment due to such use of boiler and to alignment in accordance with Myanmar Standards or International Standards.

There were 905 boiler are registered at BI Department under DISI Yangon Region 0n 30, September, 2016. 5.41% of those boilers were in non-industrial zones. 77 boilers are in public industries and 828 boilers are in private industries and the

amounts of registered boilers have been increasing year by year. On 1st, October, 2018, the total registered boilers in BI department (Yangon region) were 1079 numbers including 81 in public industries and 998 are in private industries. Over 93 % of boilers are used in Yangon industrial zones.

In Chapter 6, Boiler Law (2015) prohibited that "No one shall operate and maintain the boiler without holding boiler attendant certificate". That is the right prohibition to ensure boiler safety not only for operators (workers) but also for other impact to machines or surrounding in industry. Boiler Attendant Certificate means a recognized certificate issued by the chief Boiler Inspector to a person who meets with specified qualification in the work relating to boiler operation and maintenance. And another boiler safety prohibition is that "No one shall adjust and alter the safety valve in order to exceed the allowable pressure on his violation or under instruction of the owner". So the owner or employer of industry should not use a boiler at a pressure more than allowable pressure, and not to force to repair and alter the safety valve exceeding allowable pressure.

Boiler operator who has Boiler Attendant Certificate should obey the following responsibilities as for supporting not to be happened boiler accidents in industries. The boiler should maintain the Normal Operating Water Level (NOWL) and importantly the hot boiler must not be   added water when the water level cannot be determined. The boiler operators having Boiler Attendant Certificate should follow standard operating procedure (SOP) and all instructions (written of verbal) from the safety officer of his industry or boiler inspector.

3.3.2   Industrial Electrical Safety

The electricity law was enacted in the year 1984 to replace the Electricity Rules 1937. The Law was amended by the State Law and Order Restoration Council Law No.3/90 in the year 1990. On 27th October 2014, this Law was amended by the Electricity Law (2014) (Pyidaungsu Hluttaw Law No.44 /2014). Electrical Inspection Department in DISI under Ministry of Industry is carrying out inspection of electricity related business and the electrical equipment in accordance with the Electricity Law (2014) and existing regulations (Electricity Rules and Regulation 1985).The duty of EI are inspecting the high and low power utilization, the internal wiring of the public and private industries, the internal wiring of the public and private buildings, electrical appliances such as battery chargers, heaters, welders, generators, power

meter and etc., elevators, escalators, high voltage lines and sub-station and issuing the certificate of electrical safety above concerned,and some others issuing are the certificate of registration for power generation and distribution, the electrical professional certificate to the certified person, and the certificate of conformity and certificate of the electrical safety after testing the local and import electrical and electronic goods with IEC standards at laboratory. Priority of EI department aims the safety of public from electrical hazards. The objectives of EI are to protect the human health and safety from electrical hazards, to improve the efficiency of the electrical appliances and human resources, to prolong the life of electrical and electronic equipment, to determine the dispute or argue between electricity supplier and consumer, and being used the electricity beneficially and safety.

The Electrical Inspection Department open basic electrical training courses and special upgrade electrical training courses to foster skillful electrical workers as well as electrical technicians for human resources development and to operate and control safety any electrical appliances. To be harmonized the Electrical and Electronic Equipment in ASEAN Region, JSCEEE members in ASEAN Region must be implement AHEEERR. Electrical Inspection Department is responsible the focal point of JSCEEE.

Electricity is widely recognized as a serious workplace hazard, exposing employees to electric shock, burns, fires and explosions. It is well known that the human body will conduct electricity. If the body contact is made with an electrically energized part while a similar contact is made simultaneously with another conductive surface that is maintained at a different electrical potential, a current will flow, entering the body at one contact point, traversing the body and then exiting at the other contact point, usually the ground. If the current involved is great enough, electric arcs while switching on or switching off condition can start a fire. By conductors carrying too much current can also be create fire. High voltage can occur flash over or any electrical hazards because of its electric field not even touch the energized wires or machine or equipment.

As basic electrical safety facts for industrial workplace, employers are required to implement and document an electrical safety program to direct employee activities in a manner that is appropriate for the different voltage, energy level and circuit conditions that may be encountered. Employees who may be exposed to

electrical hazards must be specifically trained to understand the hazards associated with electrical energy as well as the safety related work practices and procedures required to provide protection from them. To avoid electric shocks and possible electrocutions, the following precautions are some basic electric safety facts for industrial workplace according to the Electricity Rule and Regulation 1985 and international standards such as NFPA 70E, IEC standards.

As general precautions for the factories , only authorized personnel can repair and maintain electrical and electronic equipment. When someone work on electrical equipment, open and tag the circuit breakers (LOTO), main supply switches or cutout switches. There must be secure cover fuse boxes and junction boxes, except when someone is working on them. It is not need to work on electrical equipment and machines if any workers is mentally or physically exhausted and it is important not to handle energized electrical machines and equipment when someone is wet or perspiring heavily. Reporting to the immediate supervisor or safety officer must be requires if any unsafe condition happened or any equipment or machines that worker consider to be unsafe. Warning is required if worker believe to be endangered. Frequently, factories have to exercise reasonable caution during any unforeseen hazardous occurance, as is appropriate to the situation (https://www.courses, netc.navy.mill/ courses/14009A/ 14009A-ch2.pdf).

3.3.3 Industrial Fire Safety

Fire or combusting is a chemical chain-reaction accompanied by evolution of intense heat and light. Fire or combustion occurs when three elements react. First element is fuel such as fuel or combustion materials, such as newspapers, clothing, curtains, carpet, furniture, etc. And the second element is oxygen which is present in the air. The last element is heat which may be emanated from flames, electricity, hot metal or even a tiny spark of fire.

If condition are right, a fire can start almost anywhere at any time. Community is at the heart of understanding, planning and implementing fire prevention measures. However, government intervention in policy, guidelines and enforcement for fire prevention and mitigation of loss and damage are also important. The Myanmar Fire Services law was enacted in the year 1997 and the Law was amended by the Myanmar Fire Brigade Law (2015) (Pyidaungsu Hluttaw Law No.11/2015). In Myanmar, the Fire Services Department (FSD), under Ministry of Homes Affairs, is

the nodal department for fire mitigation, preparedness and response measures. The headquarters of the FSD is in Yangon. The responsibilities are fire precaution, fire prevention, fire extinguishing, social and humanitarian services and organizing and capacity building of the auxiliary and voluntary firefighters. Fire hazards account for 70 percent of disasters in Myanmar and annual losses are approximately 12 billion kyats according to fire cases in Myanmar (1983 to 2009).

In industry, people can be protected during an emergency case of fire in three ways such as by removing the people from the harmful effects of the emergency, by controlling the emergency and by defending the occupants from the consequences of the emergency in place. These options are not mutually exclusive and can be applied in combination. For emergency condition of fire in industry, exits are a critical part of overall life safety. The number of exits needed is determined by the type of occupancy, the number of occupants, and the hazards present. One of the key elements of life safety is effective control of the spread of smoke and fire. To provide occupants with maximum time possible for escape, the hazardous products of the fire contained and structures also should have built-in features to limit the spread of smoke and fire. Delay in reporting emergencies to the FSD has been a contributing factor in many large loss fires. Personnel must be trained in the appropriate evacuation procedures (Schroll, 2002).

On the list of life safety evacuation procedure for fire safety should include two ways out from all areas, evacuation alarm audible in all areas, public address system audible in all areas, evacuation diagrams posted. There are also issues relative to each exit that should be considered. These are signs posted and in good condition (legible, light working if illuminated type sign), emergency lighting present, correctly aimed and working, unlocked doors and so on.

Factories must be provided "Passive systems" and "Active systems". Passive systems are those devices, features and characteristics that are installed as part of a process or structure designed to avoid fire ignition, limit fire development and growth, prevent the spread of fire and otherwise contribute to loss prevention and control efforts without any actively functioning components. An example of a passive system is a fire wall. Active systems are components of installed fire protection that actively participate by functioning in a mechanical way at the time of an emergency. For example, a sprinkler system operates to discharge water for the purpose of control and extinguishment of a fire at the time the fire occurs.

Fire extinguishers are very effective life-saving tools if they are used properly and come in different varieties which are five categories based on the type of fuel. Extinguishers must be inspected regularly to ensure that they are ready in the event of a fire. Make sure that the extinguisher is located where it is supposed to be and that the location is still satisfactory. OHSA regulations permit individual organizations to select any of five options for manual firefighting. These options and some of the associated requirements are illustrated in figure. Types of fire extinguishers can be seen in appendix (4).

3.4   Personal Protective Equipment (PPE) and Safety Signs

PPE is any of a number of device or types of equipment (hard,-hats, gloves, goggles, etc.) worn to provide protection against various hazards. According to the hierarchy of control, the easy ways in prevention and the last resort from hazards are using PPE. Employers have duties concerning the provision and use of PPE at work. PPE should be chosen carefully and ensure employee are trained to use it properly and know how to detect and report any faults. Workers or visitors should be consulted on suitable PPE by the employers to have regard of the type of work and level of risks. Variety of protection and items can be included. Some of them used in industries are as follow (OSHSA, 2004). Workers have the obligation to make proper use of and take good care of PPE. PPE use in a lot of protections which are eye and face protection, head protection, foot and leg protection, hand and arm protection, body protection , hearing protection and respiratory protection.

As determined by work, employees must be trained to know at least that are when and what and PPE is necessary, how to apprppriately put on, take off, adjust and wear the PPE. Employees also should know the limitations of the PPE, proper care, maintenance, useful life and disposal of PPE (Nay Soe Hlaing, 2016).

Some safety signs and signals notices are required where despite putting in place all other relevant measures, a significant risk to the health and safety of employees and others remains. The competent authority should ensure that criteria consistent with local or international regulations. Those must be clear and legible and should be used to identify actions that are prohibited (e.g. no access), safeguards that must be followed (e.g. ear protection must be worn), warning of a hazard (e.g. corrosive material) and to direct towards fire exits/ equipment of first- aid equipment. But that should avoid using too many signs which may cause confusion. If the hearing

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or sight of any employee is impaired for any reason, additional measures may need to be taken to ensure that employees can see or hear the warning sign or signal, for example, by increasing the brilliance or volume. In some cases more than one type of safety sign may be necessary, for example, an illuminated warning sign indicating a specific risk combined with an acoustic alarm meaning 'general danger' to alert people or hand signals combined with verbal instructions.

A variety of methods of communication OSH information in addition to the traditional safety sign or signboard are provided in OSH regulations. Pyidaungsu Hluttaw enacts Occupational Safety and Health Law (Law No 8 of 2019) on 15, March, 2019 but regulations does not yet and so far. Putting safety signs, signals and notices in place should be according to international OSH regulations and standards. In some industries, safety signs will normally be provided by the employer or person in charge of the workplace, usually the owner or operator of the installation. Most of industries in Myanmar, safety signs and signals are provided by the primary OSH regulator FGLLID. At the present, they, together with other safety authorities, are giving safety knowledge sharing seminars supported by ILO ensuring to be effective and well integrated tripartite relevant in safety which participation of employers, employees, and government.

Safety and / or health sign means a sign providing information or instruction about safety or health at work by means of a signboard, a color, an illuminated sign or acoustic signal, a verbal communication or hand signal. Signboard includes a sign which provides information or instruction by a combination of shape, color and a symbol or pictogram which is rendered visible by lighting of sufficient intensity. The figures of safety signs can be seen in appendix (5).

Different types of signboards are –

1. Prohibition sign — a sign prohibiting behavior likely to increase or cause danger (e.g. 'no access for unauthorized person')

2. Warning sign — a sign giving warning of a hazard or danger (e.g. 'danger: electricity')

3. Mandatory sign — a sign prescribing specific behavior (e.g. 'eye protection must be worn')

4. Emergency escape — a sign giving information on emergency exits, first-aid or first-aid sign facilities

There is a color to which a specific meaning is assigned in industrial safety management. One of the important ways of communicating hazards to workers is showing by specific colors. By using safety signs with specific color let understanding and recognizing employees and visitors quickly.

Table (3.1)   Color of Safety Signs

Color	Meaning or Purpose	Instruction and information
Red	Prohibition sign danger alarm	Dangerous behavior, shut down, emergency cut-out devices, evacuate
Yellow of Amber	Warning sign	Be careful, take precaution, examine
Blue	Mandatory sign	Specific behavior or action
Green	Emergency escape First-aid sign No danger	Return to normal

Source: Safety signs and signals, The Health and Safety Guidance on Regulations, HSE book, www.hsebooks.co.uk

Industrial safety signs and signals (such as symbol or pictogram, illuminated sign, acoustic signal, verbal communication, hand signal, fire safety sign, etc.) have their own intrinsic features. For example, intrinsic feature of firefighting signs are rectangular shape or square shape and drawn in white pictogram on a red background (the red part to take up at least 50% of the area of the sign). But emergency escape for fire safety signs is green color instruction of doors, exits and escape routes.

CHAPTER 4
SURVEY ANALYSIS

4.1 Survey Profile

It is expected that the research would have contributions to the organization safety in particular and the factories in general. Yangon is composed of four major districts namely Eastern, Western, Southern and Northern district. The survey questionnaires data collected during 15 August 2019 to 25 October 2019. A survey was randomly cluster sampled and conducted in 150 industries in Eastern District Industrial Zones, Yangon. As for population, it include of 11 Industrial Zones. The total registered enterprises are 2456 in industrial Zones.

The purpose of survey was to obtain a general knowledge and understanding of the status of safety management in general among different size, classification and investment of industries. This chapter presents the exploratory analysis of the responses obtained from the survey questionnaire. The exploratory survey questionnaire was undertaken after the review of the pertinent literature. A self-administered questionnaire survey was carried out to collect as much as all views in tripartite and perception about the safety management practices and performance of the industrial organisation.

4.2 Survey Design

The questionnaire was based upon the literature review and incorporated some variables in local elements. Determining the content of individual industry questions is very considerable to ensure good responses. Questions were posed about some elements of safety management (policy, procedures, training and induction, monitoring and supervision), awareness of safety (personnel responsibility), barriers (safety measures), and effectiveness of government supervision. This study is based on quantitative survey data using questionnaires and descriptive methods. And it offered multiple answers to the respondents. A covering letter was attached to each questionnaire which explained the aims of the research, introduced to researcher, stressed the confidentiality of the response and asked the respondent to help by returning the questionnaire at the appointed time. The questionnaire for this paper can be seen in appendix (6). Some questions to collect overview of supervision condition

which relevant industrial safety regulatory bodies such as Factories and General Labour Laws Inspection Department (FGLLID), Boiler Inspection and Electrical Inspection Department under Directorate of Industrial Supervision and Inspection (DISI), and Fire Services Department (FSD) are involved.

4.3   Survey Results

The final questionnaire was sent to (9) of (11) industrial zones out in East District Industrial Zones. In survey questionnaires, the meaning of collection in size, classification and investment are just collecting for the reason of information because the main objective of this survey is to analyse on whole condition of voluntary and government supervised safety management, it is not intended to compare among in size, classification and investment. It was distributed directly by hand to 150 factories. "Microsoft Excel" and SPSS 23 was adopted to analyse the data collected using descriptive statistics. List of distributed industries are shown in Table 4.1.

Table (4.1)   Number of Questionnaires Distributed

No	Industrial Zone Name	Number of Respondents	Percentage
1	Dagon Seikan	40	26.7
2	East Dagon Zone(1)	5	3.3
3	East Dagon Zone(2)	12	8.0
4	North Okkalapa	21	14.0
5	South Dagon Zone(1)	19	12.7
6	South Dagon Zone(2)	`13	8.7
7	South Okkalaa	9	6.0
8	Shwe Paukan	23	15.3
9	Thar Kay Ta	8	5.3
	Total	150	100

Source: Survey Data

The population was sampled by random cluster sampling as described in above and the collected survey data of enterprise sizes were covered in all industries. In collected data, there were 39(26%) industrial enterprises in large, 84(56%) industrial enterprises in median and 27(18%) industrial enterprises in small. The

respondents of 13 Classification of industries have each different percentage according to DISI shown in Table 4.2.

Table (4.2)   Sizes and Classifications of Industrial Enterprises

No	Classification of Industries	Large	Median	Small	Total	Percentage
1	Food and Beverages	4	`12	3	19	12.7
2	Clothing and Wearing Apparel	10	8	1	19	12.7
3	Construction Materials	3	8	7	18	12.0
4	Personal goods	4	13	6	23	15.3
5	Consumer goods	9	7	0	16	10.7
6	Literature and Art	1	7	1	9	6.0
7	Raw Goods Production	1	9	2	12	8.0
8	Metal and Mineral Production	1	6	0	7	4.7
9	Agriculture Machinery	1	0	1	2	1.3
10	Industrial Tools and Equipment Production	3	7	4	14	9.3
11	Automobile Production	0	1	0	1	0.7
12	Electrical Equipment	2	2	1	5	3.3
13	General	0	4	1	5	3.3
	Total	39	84	27	150	100
	Percentage	26	56	18	100	

Source: Survey Data, 2019

There were 92.7% of respondents involved in local investment, 4.7% of respondents involved in foreign investment and 2.7% of respondents involved in joint venture investment. The colleted data including investment of industries and size of industries from respondents is shown in table (4.3) as follow.

Table (4.3)   Respondents in Investment and Sizes of Industrial Enterprise

No	Investment of Industry	Size of Industry			Total	Percentage
		Large	Median	Small		
1	Local	35	`78	26	139	92.7
2	Foreign	3	4	0	7	4.7
3	Joint Venture	1	2	1	4	2.7
	Total	39	84	27	150	100
	Percentages	26	56	18	100	

Source: Survey Data, 2019

4.3.1 Some Elements of Industrial Safety Management

This part aimed to determine whether the industry have some safety elements such as policy, objectives, procedure, reporting and learning. And this part also compares between the business unit policies and safety policies of industrial enterprises. Safety elements are important of safeguarding human life and to reduce risks to people and processes in workplace.

Table (4.4)   Safety Elements

No	Statements	Yes	No	Not available (don't known)	Total
1	Does your industry have industrial safety management policy?	107 (71.3%)	35 (23.3%)	8 (5.3%)	150
2	Does your industry set goals and /or objectives in relations to safety at the work?	113 (75.33%)	29 (19.33%)	8 (5.3%)	150
3	Are safety roles and responsibilities clearly defined?	104 (69.3%)	38 (25.3%)	8 (5.3%)	150
4	Business units customize safety policies to meet the needs of their business.	92 (61.3%)	43 (28.7%)	15 (10%)	150
5	The management of industry has a system for reporting on and process learning from safety experiences.	110 (73.3%)	34 (22.7%)	6 (4%)	150

Source: Survey Data

According to the Table (4.4), 71.3 % of industrial enterprises have industrial safety management policy, 75.33% of respondents set goals and/or objectives in relations to safety at the workplace. 69.3% of respondents are clearly defined the safety roles and responsibilities. But 61.3% of business units of respondents

customize safety policy to meet the needs of their business. Safety is more or at least equal important in organization comparing with business. Although the cost of creating a solid safety program is expensive, not only does a well running safety program protect lives, but also organization money can be saved in present and the long run. Most of the industrial enterprises (73.3%) have a system for reporting on and process learning from safety experiences.

4.3.2   Main Cause of Accident by Anyone in Industries

Most of the accidents on workplace in industrial enterprises are caused by unsafe acts of anyone who may be the workers or managers or inspectors. Accidents may be happened by the lack of safety knowledge of workers or mismanagement in industrial enterprises or weakness of inspector. The main cause of accident by whom in workplace must be identified and safety experiences must be leant from those accidents not to occur similar accident again.

Table (4.5)   Cause of Accident on Workplace

No	Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
1	the workers are lack of safety knowledge	31 (20.7%)	13 (8.7%)	24 (16%)	74 (49.3%)	8 (5.3%)	150
2	because of management error	39 (26%)	31 (20.7%)	38 (25.3%)	39 (26%)	3 (2%)	150
3	weakness of government inspectors in inspection and supervision	42 (28%)	52 (34.7%)	31 (20.7%)	23 (13.8%)	2 (1.3%)	150
	Total	112 (24.9%)	96 (21.3%)	93 (20.7%)	136 (30.2%)	13 (2.9%)	450
	Effective safety management not to occur any accidents in industries						

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| 4 | Must be effective tripartite management activities among government, employer and employees. | 1 (0.7%) | 2 (1.4%) | 8 (4.7%) | 117 (78.4%) | 22 (14.9%) | 150 |

Source: Survey Data, 2019.

According to the Table (4.5) 24.9% of industries are strongly disagree that cause of accident in industry is occurred by one or more person who are workers, employer (Management) and government' inspector. The respondents stated that 730.2% of industries are disagreed, 20.7% of industries are neutral, 30.2% of industries are agreed and 2.9 % of industries answered strongly agree on above conditions. As a matter of facts no one can assume that accident on workplace is occurred by one of them exactly. All the participants in tripartite are responsible on safety measure in industrial safety management. Industrial enterprises claimed that 78.4% of them agree and 14.9% of them are strongly agree that effective safety management not to occur any accidents in industries must be effective tripartite management activities among government's inspector, employer and employees. It showed most of them understand that effective tripartite management which co-operation among government, employer and employees is important in safety management activities.

4.3.4 Some Needs to Maintain the Development Condition of Safety Culture in Industrial Enterprises

This part indicated that how much understanding of cooperation is needed to maintain the development of safety culture in industry among regulatory authority and industrial organization, senior and junior member of group in industry, reaction of personnel in workplace and acceptance of particular technologies. A factory with a strong safety culture can reduce number of accidents, fatalities and injuries. So, maintaining the development of safety culture in industrial enterprise is really needed.

Table (4.6)   Co-operation on Safety Measures in factories

No	Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
1	Interactions between industry and regulatory authority personnel.	1 (0.7%)	1 (0.7%)	14 (9.3%)	121 (80.7%)	13 (8.7%)	150
2	Interactions between senior and junior members of a group	1 (0.7%)	1 (0.7%)	6 (4%)	116 (77.3%)	26 (17.3%)	150
3	The degree to which information is shared internally and with the regulatory authorities	1 (0.7%)	2 (1.4%)	21 (11.5%)	107 (71.3%)	19 (12.7%)	150
4	The prevalence of teamwork in the regulatory authority or industrial organization	1 (0.7%)	2 (1.4%)	14 (9.3%)	119 (79.3%)	14 (9.3%)	150
4	Reactions of personnel under demanding operational conditions	1 (0.7%)	3 (2.1%)	14 (9.3%)	113 (75.3%)	19 (12.7%)	150
6	The acceptance and utilization of particular technologies	1 (0.7%)	0 (0%)	10 (6.7%)	125 (83.3%)	14 (9.3%)	150

Source: Survey Data, 2019.

. According to the above table(4.6), 80.7% of respondents agree that interactions between industry and regulatory authority personnel is needed   to maintain the development condition of safety culture in industry and also 77.3% of respondents agree that interaction of senior and junior member in group is needed for safety culture in industry. Most of the respondents agree (71.3%) and strongly agree (12.7%) that sharing degree of information between internally and with the regulatory authorities are important.79.3%of respondents are agree and 9.3% of respondents are

strongly agree that the prevalence of teamwork in the regulatory authority or industrial organization is needed to maintain for safety culture.

Most of industrial enterprises also understanding those reactions of personnel under demanding operational conditions, and the acceptance and utilization of particular technologies are consequential on safety measures to maintain safety culture. To develop a safety culture, organization should fully integrate that mentioned above questions because 80% of workplace accidents are the result of unsafe acts, not unsafe conditions. By focusing on unsafe behaviors, an organization may be able to generate an immediate and tangible reduction in accident frequency and severity.

4.3.5   Responsibilities for Effective ISM

This part aimed to determine how employer provided and understand his responsibilities on workplace safety, aims to know the pursuance of employees and aims to appraise the performance of safety manager/officer/supervisor. Everyone or each in industrial enterprises is important for workplace safety. In order to promote safety, it is a duty and moral responsibility of them to look after the workers protection.

Table (4.7)   Provision and facilities for safety by the employer (Owner of the Company)

No	Statements	Yes	No	Not available (don't known)	Total
1	Provision of a safe work environment for workers.	136 (90.7%)	9 (6%)	5 (3.3%)	150
2	Provision of Personnel Protective Equipment (PPE) for workers and visitors	111 (74%)	28 (18.7%)	11 (7.3%)	150
3	Provision of the required facilities and machines for production.	113 (75.3%)	29 (19.3%)	8 (5.3%)	150

4	Provision of safety training for workers.	97 (64.6%)	42 (28%)	11 (7.3%)	150
5	Ensure proper and constant maintenance of equipment and tools used during production.	134 (89.4%)	8 (5.3%)	8 (5.3%)	150
6	Provision of first aid facilities in the company	112 (74.7%)	26 (17.3%)	12 (8%)	150
7	Ensure proper guard of moveable and dangerous parts of machines in the company.	123 (82%)	19 (12.7%)	8 (5.3%)	150
8	Enforced strictly safety rules and regulations.	114 (76%)	30 (2%)	6 (4%)	150

Source: Survey Data, 2019.

According to table (4.7), (90.7%) of employer provided a safe work environment for workers. (74.0%) of respondents answered that they provided PPE for workers and visitors. Safety training for workers had trained only (64.6%) and at least (74.7%) of respondents answered that they have other provisions and facilities which are first aid facilities, proper guard of moveable and dangerous parts of machines, ensuring proper and constant maintenance of equipment and tools, and enforcing safety rules and regulations. Survey data show that there is some weakness in provision of safety training for workers. Having a safety trained workforce means their workers enables the management to ensure a safe and healthy work environment their self and can also recognize safety hazards, and understand best safety practices and expectations. Most people want to do right thing in reality but they don't have the knowledge sometimes or self – awareness to do so.

Table (4.8)   Pursuance of Safety by Employees

No	Statements	Yes	No	Not available (don't known)	Total
1	Employees wear PPE (such as safety shoe, hard hat, hand gloves, eye goggles).	118 (78.7%)	18 (12%)	14 (9.3%)	150
2	Employees keep their work environment clean and arrange tools properly.	131 (87.3%)	12 (8%)	7 (4.7%)	150
3	Employees always adhere to the safety rules and regulations of the company.	138 (92%)	8 (5.3%)	4 (3.6%)	150
4	Employees report to the supervisor when they noticed that the equipment and tools they are using is not safe for job.	134 (95%)	7 (2.9%)	6 (2.1%)	150
5	Employees report every accident to their supervisor.	138 (92%)	8 (5.3%)	4 (2.7%)	150

Source: Survey Data, 2019.

Table (4.8) illustrates (78.7%) of employees wear PPE on workplace and (87.3%) of employees keep their work environment clean and arrange tools properly. (92%) of employees followed safety rules and regulations of the company and (95%) of them used to report when they noticed that the equipment and tools is not in safe condition for their jobs. Almost of every employees (92%) report every accident to their supervisor. The surveyed data show that there are good conditions in pursuance of safety by employees. The workplace rules help in protecting the rights and safety of the employees. Safety is a major concern that is addressed in a workplace policy. These concerns may include personal injuries, fire accidents, harassment, bullying and so on. Additionally, in industrial sites, workers are required to deal with heavy and dangerous machinery, hazardous elements on a regular basis. Other workplace safety issues may include electrical dangers, vehicular accidents etc. Some of these

concerns may require accident investigation to determine the causes, and enforce measures and policies to prevent them from occurring again. Obeying workplace safety reduces the possibilities of these accidents considerably. As a result, it reduces the healthcare costs of employers. However, all of the hazards is not impossible to be devoid in workplace. Therefore, the safety policies are constantly updated based on the occurrences.

Table (4.9)   Performance of Safety Manager/Officer/Supervisor

No	Statements	Never	Occasional	Sometimes	Often	Always	Total
1	Organizing pep talk before the day's job begins.	2 (1.3%)	3 (2%)	19 (12.7%)	82 (54.7%)	44 (36.5%)	150
2	Making sure that all the equipment tools are in safe condition for used.	2 (1.3%)	2 (1.3%)	12 (8%)	45 (3%)	89 (59.3%)	150
3	Ensuring that workers are performing the task according to recommended procedures.	2 (1.3%)	2 (1.3%)	11 (7.3%)	61 (4.9%)	74 (49.3%)	150
4	Ensuring adequate security on workplace.	1 (0.7%)	6 (4%)	13 (8.7%)	41 (27.3%)	89 (59.3%)	150
5	Recording workplace safety statistics in safety statistics board	15 (10.0%)	7 (4.7%)	25 (16.7%)	44 (29.3%)	59 (39.3%)	150
6	Organizing workplace safety meetings	7 (4.7%)	7 (4.7%)	23 (15.3%)	81 (54%)	26 (17.3%)	150

Source: Survey Data, 2019.

Table (4.9) described about the performance of responsible person such as safety manager or safety officer or safety supervisor in industry. The safety officer must be correct unsafe acts or condition through the regular line of authority, although the safety officer may exercise emergency authority to prevent or stop unsafe acts when immediate action is required. Only one safety officer will be assigned for each incident and may have assistants as necessary. Table (4.9) revealed that most of the safety officer use to organize pep talk before the day's job begin (often 54.7% and

always 36.5%).They make sure that all the equipment tools are in safe condition for used and workers are performing the task according to recommended procedures. Likewise, (59.3%) of them always and (27.3%) of them often ensure adequate security on workplace. But nearly 30% of person responsible for safety in industrial enterprises, that can assume too much amount, are not record workplace safety statics and organize safety meeting. Keeping records of the activities within the workplace makes managing health and safety easier. All records relating to health and safety in the workplace must be retained by the organisation. It is also important to conduct observations and liaise with the team to ensure all incidents, illness and injury, and near misses are recorded. Industrial organisation may have been asked by regulatory bodies in the past to keep a chronological of health and safety log book / diary. If some need to identify, some obvious problems should be experienced with relying on this type of record system, induction training are received by workers.

4.3.6 Miscellaneous for Effective ISM on Workplace in Industry

This part check some miscellaneous such as fire safety measures, PPE and safety signs which are important parts for effectiveness of industry safety management All the safety measures, PPE and safety signs must be compiled with the elements of ISM and all the employees must follow the safety instructions.

Table (4.10)   Fire Safety Measures

No	Statements	Yes	No	Not available (don't know)	Total
1	Are fire suppression systems (sprinklers, etc.) in place and properly maintained?	135 (90%)	9 (6%)	6 (4%)	150
2	Are fire-fighting equipment identified by using a specific color?	123 (82%)	20 (13.3%)	7 (4.7%)	150
3	Have flammable materials been stored safely and securely?	122 (81.3%)	17 (11.3%)	11 (7.3%)	150
4	Has a fire action plan been compiled?	122 (81.3%)	21 (14%)	7 (4.7%)	150
5	Personnel must be trained in the	97	42	11	150

		(64.6%)	(28%)	(7.3%)	
	appropriate evacuation procedures.				

Source: Survey Data, 2019.

Table (4.10) indicated that over (64%) of respondents have fire safety measures in their factory which are illustrated in about questions .Over one fourth of industries still need to train how to use and understanding the appropriate evacuation procedures. The best way to minimise the risk of fire is to take the threat seriously and put in place fire prevention measures. Understanding potential triggers, installing fire alarms, smoke alarms and other devices along with making and sharing fire safety plans are all ways to reduce the risk. Emergency evacuation training is essential to running a safe and successful business. can be the difference Between life and death in the event of an emergency that requires an evacuation may be different in some safety training. In the event of a workplace emergency, such as a fire or chemical spill, your employees need to know how to properly respond to the emergency at hand and how to safely evacuate the building. Ultimately, everyone is responsible for preventing fires in the workplace – employers and employees alike. In addition to possible injury and loss of life, a serious fire can close down a workplace resulting in significant job losses. A small occurrence can quickly grow to become a major incident with devastating outcomes without proper training.

Table (4.11)   Personal Protective Equipment

No	Statements	Yes	No	Not available (don't know)	Total
1	Do employees wear protective equipment when required?	91 (60.7%)	36 (24%)	23 (15.3%)	150
2	Is safety equipment inspected on a regular basis?	86 (57.3%)	43 (38.2%)	21 (14%)	150
3	Required PPE is made available to employees	96 (64%)	32 (21.3%)	23 (15.3%)	150
4	All employees who require using PPE are trained on proper PPE usage for their individual work area?	81 (54%)	48 (32%)	21 (14%)	150

| 5 | All damage PPE is taken out of service immediately? | 90 (60%) | 40 (26.7%) | 20 (13.3%) | 150 |

Source: Survey Data, 2019.

According to Table (4.11), employees who are workings in 24% of industries do not wear PPE when required and 28.2% is not inspected the safety equipment on a regular basis. Many times workers do not adhere to PPE requirements because they feel it is a nuisance to wear or slows them down during a task. Using and wearing PPE properly is vital to avoid unnecessary injury in the workplace. Choosing not to wear PPE can be dangerous especially when it could save their life. Results staffing always provides workers with necessary PPE unless otherwise noted. They should be never hesitating to safety manager if they have the necessary PPE. Safety is important and having an understanding of these various protection devices can help to prevent hazardous injury. Most of industries are made available required PPE to employees. PPE is used only when some type of hazard has been identified and cannot be eliminate or controlled through other means. But nearly half of them are not trained on proper PPE usage for their individual work area and some of them (26.7%) do not taken damage PPE out of service immediately. PPE that is not properly maintained will not last long and will not protect the user. In fact, poorly maintained equipment can be a greater hazard. Although PPE has a key role, there are difficulties in assessing its overall impact in preventing injuries and ill health.

Table (4.12)   Provision of Safety Signs

No	Statements	Yes	No	Not available (don't know)	Total
1	Prohibition sign	122 (81.3%)	21 (14 %)	7 (4.7%)	150
2	Warning sign	125 (83.3%)	16 (10.7%)	9 (6%)	150
3	Mandatory sign	107 (71.3%)	22 (14.7%)	21 (14%)	150
4	Emergency escape sign	76 (50.7%)	47 (31.3%)	27 (18%)	150

Source: Survey Data, 2019.

Table (4.12) shows that most of the industrial enterprises provide some safety signs which are prohibition sign, warning signs and mandatory signs. But provision of emergency escape sign are just (50.7%) in industries. Almost half of industries are weak in provision of emergency escape signs in their industry. Safety Signs are crucial in any work environment. The primary importance of displaying Safety Signs is to prevent injury and ensure staff and visitors are well aware of the possible dangers and hazards ahead in certain situations and/or environments. Emergency exit routes are important because they provide a clear, safe way to evacuate a building in case of a crisis or disaster. First responders such as fire or police may also utilize emergency exits to enter a building during a disaster or crisis. An important part of workplace are identifying and maintaining emergency exits and emergency exit routes. All of fire doors, escape routes and associated lighting and signs must be regularly checked. Without signs, many employees would lack the necessary direction in times of crisis, and employers might find themselves in significant legal difficulties if any accidents were to arise as a result.

4.3.7 Supervision and Inspection by government

This part observes the situation of cooperation between regulatory bodies that are concerning workplace safety in industry and safety management team of industries. And this part is also finding that supervision and inspection of regulatory bodies are whether effective or not for industrial safety management. Employers are obligated to ensure that work is performed and machinery is used under the general supervision and inspection by the government or a competent person (manager, supervisor; foreman etc.). Supervisors must be appointed with the authority to ensure that precautionary measures taken by the employer are implemented and carried out at the workplace. Authority can implies the right to make decisions and the power to direct others.

Table (4.13)   Supervision of Local Departments

No	Statements		Departments			
			FGLLID	FSD	EI	BI
1	Does your industry have any certificate or	Yes	134 (89.3%)	128 (85.9%)	150 (100%)	37 (24.7%)

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	permit related to following regulatory bodies?	No	8 (5.3%)	13 (8.7%)	0	9 (6%)
		Not available	8 (5.3%)	9 (6 %)	0	104 (69.3%)
	Total		150	150	150	150
2	Your industry is annually inspected and supervised by following regulatory bodies.	Yes	133 (88.7%)	138 (92%)	148 (98.7%)	48 (32%)
		No	9 (6%)	4 (2.7%)	0	13 (8.7%)
		Not available	8 (5.3%)	8 (5.3%)	2 (1.3%)	89 (59.3%)
	Total		150	150	150	150
3	Has specific training been provided for those in industry with specific following duties?	Yes	106 (70.7%)	117 (78%)	116 (77.3%)	40 (26.7%)
		No	25 (16.7%)	20 (13.3%)	27 (18%)	19 (12.7%)
		Not available	19 (12.6%)	13 (8.7%)	7 (4.7%)	91 (60.6 %)
	Total		150	150	150	150

Source: Survey Data, 2019.

According to Table (4.13), 89.3% of industries have FGLLID permit, 85.9% of industry have FSG permit and wonderfully all of industries have EI certificate. Most of the industry do not need boiler. According to table, although 37 industries have boiler license, 9 industries does not have the boiler license. So, almost 25% of industrial enterprises still need to apply boiler license. Over 90% of regulatory bodies, which are FGLLID,FSD and EI ,are annually inspect and supervise the industries but 13 out of 61 industries , which is too much amount, are not inspected and supervised by boiler annually. And 19 out of 59 industries have not been provided boiler training for specific boiler duties. Boiler systems have the ability to generate energy, heat buildings large and small. But they can also be dangerous if employees are not properly trained in their operations, maintenance, and safety.

Table (4.14) Effectiveness of Regulatory Body for ISM

No	Departments	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
1	FGLLID	3 (2%)	7 (4.7%)	6 (4%)	105 (70%)	29 (19.3%)	150
2	FSD	3 (2%)	5 (3.3%)	6 (4%)	110 (73.3%)	26 (17.3%)	150
3	EI	7 (4.7%)	5 (3.3%)	6 (4%)	96 (64%)	36 (24%)	150
4	BI	3 (3.5%)	4 (4.7%)	4 (4.7%)	52 (61.2%)	22 (25.9%)	85 (65 factories do not have boiler)
		16 (3.0%)	21 (3.9%)	22 (4.1%)	363 (67.9%)	113 (21.1%)	535

Source: Survey Data, 2019.

The regulatory body has the obligation to translate the strength in workplace safety assurance that the probability of a serious accident is very low. Nevertheless, some regulatory bodies have less than limited resources to perform their duties in accordance with international standards, being almost impossible to cover the main functions.

According to the table (4.14), (67.9%)of respondents are agree and (21.1%) respondents are strongly agree on that the supervision and inspection by regulatory bodies are really effective actions for the sake of safety in their industry. Nowadays, the government regulatory bodies give awareness and initiate workplace safety in industries. A regulatory body is like a professional body and its primary activity is to protect any workers in industrial enterprises. Its purpose is to protect, promote and maintain the health and safety in industrial enterprises by ensuring proper standards in the practice. So, the effectiveness of the regulatory body is really important issue in ISM. Above table showed that there are effective conditions of government inspectors in industrial safety management.

CHAPTER 5
CONCLUSION

5.1   Findings

This thesis is outlining my finding of the situation about industrial safety management in Yangon industrial zones. It show present condition of voluntary or government supervised industrial safety management activities of industries. Through there have been some differences among the respondents according to sizes of industrial enterprises, investment of industrial enterprises, products of industrial enterprises and may also be effected by the amount of workers in industries, this case study is being hoped that can be appraised all – embracing the present industrial safety management condition on industrial zones in Yangon. In this study, 150 respondents in which (9) industrial zones of East District Industrial Zones are represented by 100 percent of industries in Yangon's Industrial Zones. The collected data of industrial enterprises sizes were covered in all sizes. Most of the respondents are from median industrial enterprises and the least are from small industrial enterprises.

Most of the industrial enterprises have some safety elements such as policies, objectives, procedure, reporting and learning. But over 20% of industries still need to have some safety elements which are safety management policy, clearly defined safety roles and responsibilities, a system for reporting on and process learning from safety experiences. A lot of industries need to promote safety policies compare with their business units. Their business units customize safety policy to meet the needs of their business

Most of industrial organizations believed that the main causes of accidents are occurred by the lack of safety knowledge of the workers or by the management error. But they do not accept that is because of weakness by government's inspectors or supervisors in related fields. Almost all of industries realise that tripartite management activities, which are co-operation among government's inspectors, employer and employees, are effective safety management activities not to occur any accidents in industries. As a matter of fact, main cause of accident is not occurred to stay one of tripartite hand. All are responsible to look up the problem in each safety aspect and it

is not fair to blame on only anyone who is employee or employer or government's inspectors.

As the results showed, most are agree or strongly agree that interactions between industry and regulatory authority personnel or between senior and junior members of a group in industry are really needs to maintain the development of safety culture. Most of the industrial enterprises realise strongly co-operation is needed on safety measures in industry. Most of industrial organizations also understand those reactions of personnel under demanding operational conditions, and the acceptance and utilization of particular technologies are consequential on safety. Just a little amount of industrial organization cannot be sapient crucial safety parts that are the prevalence of teamwork in the regulatory authority or industrial organization, the degree to which information is shared internally and with the regulatory authorities, and reactions of personnel under demanding operational conditions.

At the point of view in responsibilities, most of the employers used to provide some sort of safety facilities and ensure proper and constant maintenance of equipment and tools, proper guard of moveable and dangerous parts of machines. Although they had enforced strictly safety rules and regulations, over 15% of industrial enterprises still needs to enforce. This study can consider that most of industrial enterprises provide a safe work environment and PPE for workers and visitors in their industrial workplace. Most of employees are used to wear PPE, keep their work environment clean and arrange tools properly adhere to the safety rules and regulations of the company. Moreover, they report to the supervisor when they noticed that the equipment and tools they are using in are not safe for job. Most are report every accident to their supervisor .It showed employees are observance of their safety responsibilities on workplace. There are many safety performance activities in ISM by safety manager/officer/supervisor. A few amount of safety managers always organize pep talk and organize workplace safety meetings. Over half of safety managers always make sure that all the equipment tools are in safe condition and ensuring adequate security on workplace. Also over 60% of them ensuring that workers are performing the task according to recommended procedures and. They still need more performance and need to understand that if more performance they do always, safer environment they can get. Some of them are not used to record workplace safety statistics.

In many factories, the fire suppression systems are in place and properly maintained, and identified by specific color. They store flammable materials safely and securely and also a fire action plan has been compiled. But over one fourth of industries, workers are still need to be trained how to use and understand the appropriate evacuation procedures. From the collected data, it is possible to say that although most of the industries had made available required PPE to employees, over one fifth of employees in the workplace do not wear PPE when required and safety equipment in some factories is not inspected on a regular basis. Some of them are not trained on proper PPE usage and do not used to take out of service all damage PPE immediately. Most of the industries provide some safety signs such as prohibition sign, warning signs and mandatory signs, but almost half of industries are weak in provision of emergency escape signs in their industry.

By observing the situation of cooperation between regulatory bodies and safety management team of industrial enterprises, not only almost all of industries have and achieve the permits or licenses but also have being inspected and supervised annually by regulatory bodies which relevant to industrial safety such as FGLLID, FSD and EI. But some industrial enterprises, which used boiler in their production process, do not have boiler licenses. Industrial organizations have being provided their workers on workplace specific training which are workplace safety training, industrial fire safety training and electrical safety training. But one fourth of industries, which used boiler, need to provide boiler safety training yet. On the other hand, the result show that most of the industries are agree or strongly agree on that the supervision and inspection by regulatory bodies are really effective for the sake of safety in their industry.

5.2   Recommendations

The main goal of industrial safety management is to prevent workplace injuries, illness, and deaths, which can cause suffering and financial hardship of workers, their family, and employers. Safety policies and procedures are taking important role in managing workplace safety and creating safer, happier and more productive environment for workers. Safety is more or at least equal important in organization comparing with business. The cost of creating a perfect safety program is costly. A well running safety program protects lives and also can prevent financial losses. Industrial business unit should use more investment in workplace safety

management. The cost of accidents is always higher than the cost of safety management even may be occurred uncountable losses and some may not be able to return normal. Obviously no one can avoid workers needing sick leave or evade minor accidents every now and again.

As possible, employers, managers, and supervisors must be achieved training on safety concepts and attention of their responsibility must be needed for protecting workers rights and responding to worker reports and concerns. All workers in relevant field must be trained to recognize workplace hazards and to understand the control measures that have been implemented for example usage of PPE. Worker must understand PPE is incredibly important, because it provides a last line of defense against injury and it can save their life. Employers are obligated to ensure that work is performed and machinery is used under the general supervision of a competent person. Supervisors must be appointed with the authority to ensure that precautionary measures taken by the employer are implemented and carried out at the workplace. Authority implies the right to make decisions and the power to direct others. Co-worker can be given responsibility for the right to act on behalf of superiors. It is important to note that the superior must be remains accountable for seeing that they are carried out while some responsibilities can be delegated.

To be effective, any safety program needs less or more meaningful participation of employers, employees, and safety inspectors as well integrated tripartite. Most of accidents couldn't happened only by one's fault of them. Safety is everyone's responsibility who related in industrial organizations. It is important to remember that most problems don't occur suddenly. They develop slowly over a long period of time. So, well management can prevent almost all of accidents.

To develop a safety culture, organization should fully integrate because most of workplace accidents are the result of unsafe acts, not unsafe conditions. By focusing on unsafe behaviors, an organization may be able to generate an immediate and tangible reduction in accident frequency and severity.

Workplace safety training is a process that aims to provide industrial workforce with knowledge and skills to perform their work in a way that is safe for them and their co-workers. Having a safety trained workforce means their workers enables the management to ensure a safe and healthy work environment their self and

can also recognize safety hazards, and understand best safety practices and expectations. The reality is most people want to do right thing, but sometimes they do not have the knowledge or self – awareness to do so.

The workplace rules help in protecting the rights and safety of the employees. Safety is a major concern that is addressed in a workplace policy. Some of accidents may require investigation to determine the causes and enforce measures and policies to prevent them from occurring again. Obeying workplace safety decreases the possibilities of these accidents substantially. As a result, the healthcare costs of employers can be reduced. However, no workplace is devoid of hazards. Workers must be report any defects in or damage to the PPE immediately. It is needed to look for broken or damaged components, before using PPE and repair or replace it. It is important to put on and remove each item correctly.

Workers may be exposed to hazards in the workplace for the purpose of having safety signage in the workplace. Safety signs encourage communications, safety messages and provide instruction for emergency situations. Some of industrial organizations in Yangon region still need to be provided more safety training, and some safety signs and signals.

All industrial enterprises in industry zones must be inspected and supervised by inspectorate of safety. All industry legally should have achieved the permit or license which concern industrial safety such as workplace safety, electrical safety, fire safety and boiler. Safety inspectors should enlighten employers and employees of their rights and responsibilities under the workplace safety legislation, and must ensure guides and regulations are being followed properly in regards to document keeping, workers and safety. A regulatory body is like a professional body and its primary activity is to protect the public. Its purpose is to protect, promote and maintain the health and safety of the public by ensuring proper standards in the practice. There must be uniquely able to recommend for improvements of industrial safety practices.

All the industries using boiler must achieve boiler license, and boiler operators must be well trained. Boiler operators have to hold boiler attendant certificate from local boiler regulatory authority. Boiler safety is really important because there may

be extremely damage to surroundings not only industrial properties but also unpredictable loss of people.

Based on surveyed data, it can be said that most of the industrial enterprises are implementing in well performances, and effective condition having industrial safety management activities by voluntary or government supervised. There should be sustainable development in the present condition of voluntary safety management, and need more enhancing safety knowledge sharing seminars by government authorities ensuring to be effective and well integrated tripartite which meaningful participation of employers, employees and government' s safety inspectors.

This thesis only emphasizes on one district industrial zone in Yangon. Thus this study does not represent to the whole industrial zones in Yangon region as well as the whole Myanmar. For future research are that would be necessary to collect much more data to be able analyse safety management conditions comparing among small, medium and large industrial enterprises specifically or to be able analyse comparing safety management conditions among foreign, local, and joint venture in investment even can compare among classification of industry. There may still be so many different questions to survey industrial safety management according to their point of views. The sample side should be widespread; to get more detail in ISM, questionnaire must be distributed to different people each such as employers, employees, safety managers and regulatory bodies and it need to be compare among them separately, even it is necessary to make interviews with a larger number of respondents. This would, however, require a much longer time frame and more extension scope than this research required.

It is believed that this study provides a positive contribution to the field. This study have been outlined effective implementation of industrial safety management in industrial enterprises and have been hoped to avail for further future research. Finally, it is important that everybody to stay alert and not to get hurt in workplace or everywhere.

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A Study on Industrial Safety Management in Yangon Industrial Zones:

Case Study on Eastern District Industrial Zones, Yangon Region

Questionnaire

My name is Than Lwin. I'm a student in Master of Public Administration Programme. This survey questionnaire aims to support my thesis which I'm currently writing. My thesis is to identify the presence condition of voluntary or government supervised industrial safety management activities in Yangon industrial zones.

I hope this survey will be a positive contribution to the field for government regulatory bodies that are supervising and inspecting industrial enterprises for the sake of workplace safety and will also be effective to industrial enterprises which implementing their workplace safety voluntarily. It would be grateful if you could kindly complete this questionnaire. You are kindly requested. Please note that I pledge all your answers are completely confidential. It is sure no one will see your individual answers.

Than Lwin

EMPA-56

16th Batch

Note: (a) To be filled up by Employer/manager/ Safety Officer (or equivalent), please.

(b) Please tick on the box provided as you known or as you wish.

Name of the industry: ---

Location: Zone: -- City: -------------------

Total Number of employees (Detail or Estimate):---

1. **Classification of Industry:**
   ☐ Food and Beverages ☐ Clothing and Wearing Apparel
   ☐ Construction Materials ☐ Personal goods
   ☐ Consumer goods ☐ Literature and Art
   ☐ Metal and Mineral ☐ Raw Goods Production
   ☐ Agriculture Machinery ☐ Production
   ☐ Industrial Tools and Equipment Production

| | Automobile Production | | Electrical Equipment | | General |

2. Size of Industry/Enterprise:

| | Small Industry | | Median Industry | | Large Industry |

3. Investment:

| | Local | | Foreign | | Joint Venture |

4. Policies Section of Industrial Organizations:

Sr.,No	Question	YES	NO	N/A
1	Does your industry have industrial safety management policy?			
2	Does your industry set goals and /or objectives in relations to safety at the work?			
3	Are safety roles and responsibilities clearly defined?			
4	Business units customize safety policies to meet the needs of their business.			
5	The management of industry has a system for reporting on and process learning from safety experiences.			

5. Main Cause of accidents:

1. The main cause of accidents on workplace is that the workers are lack of safety knowledge.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

2. The main cause of accidents on workplace is because of management error.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

☐	☐	☐	☐	☐

3. The main cause of accidents on workplace is weakness of government's inspectors in inspection and supervision.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
☐	☐	☐	☐	☐

4. Effective safety management not to occur any accidents in industries must be effective tripartite management activities among government, employer and employees.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
☐	☐	☐	☐	☐

6. To maintain safety culture in industry fundamentally, the followings need to be maintained in development situation.

1. Interactions between industry and regulatory authority personnel.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
☐	☐	☐	☐	☐

2. Interactions between senior and junior members of a group.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
☐	☐	☐	☐	☐

3. The degree to which information is shared internally and with the regulatory authorities.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

☐	☐	☐	☐	☐

4.   The prevalence of teamwork in the regulatory authority or industry organization.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
☐	☐	☐	☐	☐

5.

6.   Reactions of personnel under demanding operational conditions.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
☐	☐	☐	☐	☐

7.   The acceptance and utilization of particular technologies.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
☐	☐	☐	☐	☐

7. The employer (owner of the industry/company) has been providing the following for workplace safety in industry.

Sr.,No	Descriptions	YES	NO	N/A
1	Provision of a safe work environment for workers.	☐	☐	☐
2	Provision of Personnel Protective Equipments (PPE) for workers and visitors	☐	☐	☐
3	Provision of the required facilities and machines for production.	☐	☐	☐
4	Provision of safety training for workers.	☐	☐	☐
5	Ensure proper and constant maintenance of equipment and tools used during production.	☐	☐	☐

6	Provision of first aid facilities in the company.	☐	☐	☐
7	Ensure proper guard of moveable and dangerous parts of machines in the company.	☐	☐	☐
8	Enforced strictly safety rules and regulations.	☐	☐	☐

8. The responsibilities of employees with respect to ISM

Sr.,No	Descriptions	YES	NO	N/A
155	Employees wear PPE (such as safety shoe, hard hat, hand gloves, eye goggles).	☐	☐	☐
2	Employees keep their work environment clean and arrange tools properly.	☐	☐	☐
3	Employees always adhere to the safety rules and regulations of the company.	☐	☐	☐
4	Employees report to the supervisor when they noticed that the equipment and tools they are using is not safe for job.	☐	☐	☐
6	Employees report every accident to their supervisor.	☐	☐	☐

9. Safety manager/officer/supervisor of industry/company used to perform their following some responsibilities.

1. Organizing pep talk and all hazards associated with the task are identified before the day's job begins.

2.

Never	Occasional	Sometimes	Often	Always
☐	☐	☐	☐	☐

3. Making sure that all the equipment tools for the day's job are in safe condition for used.

Never	Occasional	Sometimes	Often	Always
☐	☐	☐	☐	☐

3. Ensuring that workers are performing the task according to recommended procedures.

Never	Occasional	Sometimes	Often	Always
☐	☐	☐	☐	☐

4. Ensuring adequate security on workplace.

Never	*Occasional*	*Sometimes*	*Often*	*Always*
☐	☐	☐	☐	☐

5. Recording workplace safety statistics in safety statistics board.

Never	Occasional	Sometimes	Often	Always
☐	☐	☐	☐	☐

6. Organizing workplace safety meetings.

Never	Occasional	Sometimes	Often	Always
☐	☐	☐	☐	☐

10. Some Fire safety Measures

Sr.,No	Questions	YES	NO	N/A
1	Are fire suppression systems (sprinklers, etc.) in place and properly maintained?	☐	☐	☐
2	Are fire-fighting equipment identified by using a specific color?	☐	☐	☐
3	Have flammable materials been stored safely and securely?	☐	☐	☐

		YES	NO	N/A
4	Has a fire action plan been compiled?	☐	☐	☐
5	Personnel must be trained in the appropriate evacuation procedures.	☐	☐	☐

11. Personal Protective Equipment

Sr.,No	Questions	YES	NO	N/A
1	Do employees wear protective equipment when required?	☐	☐	☐
2	Is safety equipment inspected on a regular basis?	☐	☐	☐
3	Required PPE is made available to employees	☐	☐	☐
4	All employees who require using PPE are trained on proper PPE usage for their individual work area?	☐	☐	☐
5	All damage PPE is taken out of service immediately?	☐	☐	☐

12. There are following different types of signboards are displayed where are required for safety in your industries.

Sr.,No	Items	YES	NO	N/A
1	Prohibition sign	☐	☐	☐
2	Warning sign	☐	☐	☐
3	Mandatory sign	☐	☐	☐
4	Emergency escape sign	☐	☐	☐

13 Does your industry have any certificate or permit which related to following regulatory bodies?

Sr.,No	Descriptions	YES	NO	N/A
1	Factories and General Labour Laws Inspection Department	☐	☐	☐

2	Fire Services Department(FSD)	☐	☐	☐
3	Electrical Inspection Department	☐	☐	☐
4	Boiler Inspection Department	☐	☐	☐

14. Your industry is annually inspected and supervised by following regulatory bodies.

Sr.,No		YES	NO	N/A
1	Factories and General Labor Laws Inspection Department	☐	☐	☐
2	Fire Services Department(FSD)	☐	☐	☐
3	Electrical Inspection Department	☐	☐	☐
4	Boiler Inspection Department	☐	☐	☐

15. Has specific training been provided for those in industry with specific following duties?

Sr.,No	Descriptions	YES	NO	N/A
1	Fire safety	☐	☐	☐
2	Electrical safety	☐	☐	☐
3	Boiler safety	☐	☐	☐
4	Workplace safety	☐	☐	☐

16. The supervision and inspection of following regulatory bodies are really effective for the sake of safety in your industry.

Factories and General Labor Laws Inspection Department

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
☐	☐	☐	☐	☐

Fire Services Department(FSD)

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

☐	☐	☐	☐	☐

Electrical Inspection Department

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
☐	☐	☐	☐	☐

Boiler Inspection Department

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
☐	☐	☐	☐	☐