



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**A STUDY ON THE COMPLIANCE OF MANUFACTURING
COMPANY TO THE FACTORIES AND MACHINERY ACT
1967 (ACT 139): A CASE STUDY**

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Manufacturing Management) with Honours.

by

SITI NORSALEHAH BT OTHMAN

FACULTY OF MANUFACTURING ENGINEERING

2011

ABSTARCT

The purpose of this project is to study about the compliance of manufacturing company with Factory and Machinery Act 1967 (act 139) .The main problem of this project, is the company should be achieve the ISO 14001 . At initially, the problem, objectives and scopes of the project are determined. The case study was started by identifying the hazard using the Hazard Identification, Risk Assessment, and Determining Control, HIRADC .Moreover this case study also using the questionnaire as a method to proceed this project. Therefore the regulation and rule for Factory and Machinery Act 1967 (Act 139) is using as a guideline for the employer and employee to comply due to hazardous prevention by institution. As a conclusion this case study will provide the solution of hazard that happen in the company. The end solution on risk assessment are that available in this project are not necessarily to apply as a main solution at the company .

ABSTRAK

Tujuan projek ini adalah untuk mengenalpasti industry pembuatan terhadap akta Kilang dan Jentera 1967 (akta 139) . Masalah utama bagi projek ini adalah syarikat pengeluaran tersebut dikehendaki mencapai ISO 14001 . Sebagai permulaan , masalah, objektif, dan skop dalam kajian ini perlu dikenalpasti . Kemudian kajian ini dimulakan dengan mengenal pasti bahaya dengan mengenalpasti bahaya (Hazard Identification), penilaian risiko (Risk Assessment) dan penentuan kawalan (Determining Control) ,HIRADC. Selain daripada itu projek ini juga menggunakan soal selidik sebagai kaedah untuk meneruskan projek ini. Peraturan dan undang-undang untuk Akta Kilang dan Jentera 1967 (akta 139) digunakan sebagai garis panduan untuk majikan dan pekerja mematuhi pencegahan bahaya oleh institusi . Sebagai kesimpulan projek ini akan menyediakan cadangan kepada syarikat bagaimana untuk menghindari daripada bahaya yang akan berlaku.

DEDICATION

To my beloved parents:

Othman Bin Bahari

Siti Zabedah Binti Chik

For your love and demonstration the values of education since I'm still a little kid

To my siblings:

Siti Nor Analina Bt Othman

Mohd Shabir Bin Othman

Siti NurHidayah Bt Othman

Siti NurRaidzzah Bt Othman

Nik Mohammad Aminuddin Abdullah

Nor Shafarina Bt Bidin

For your love, encouragement, and support on this project was absolutely invaluable

ACKNOWLEDGEMENT

Alhamdulillah..Thank to might god Allah s.w.t for giving me the fulfillment and energy to complete my project for final year. Since the project goes on, I have a great experiences and knowledge about the project that was implementing by me. I have fully satisfied with this project even though I know it is hard and need a lot of work to do to finish this project. At the end, I finally come out with the good result.

In this opportunity, firstly I would like to thank to my supervisor Mr. Nik Mohd Farid bin Che Zainal Abidin for giving me the guidance and their opinion to me during the project. The precious advice, time, contributions, comments and guidance help me to finish my project. Secondly is for my parents, mom and dad for giving me the support and praying to the success of his beloved daughter. Last but not least to all the lecturers and friends whether intentionally or not with the accomplishment with this project.

TABLE OF CONTENT

Abstract	i
Abstrak	ii
Dedication	iii
Acknowledgement	iv
Table of Content	iv
List of Table	
viii	
List of Figures	ix
List Abbreviations	x

1. INTRODUCTION

1.1	Problem Statement	2
1.2	Scope	2
1.3	Objective of Project	3
1.4	Importance of the study	3
1.5	Summary	3

2. LITERITURE REVIEW

2.1.0	Introduction of Factories and Machinery	4
2.1.1	Factory and Machinery Act (act 139)	5
2.1.1.1	Factories and Machinery (Steam Boiler and Unfired Pressure Vessel) Regulation 1970	6
2.1.1.2	Factories and Machinery (Electric Passenger and Goods Lift) Regulation 1970	9
2.1.1.3	Factories and Machinery (Fencing of Machinery and Safety) Regulation 1970	10
2.1.1.4	Factories and Machinery (Person in Charge) Regulation 1970	10
2.1.1.5	Factories and Machinery (Safety, Health and Welfare) Regulation 1970	10
2.1.1.6	Factories and Machinery (Certificate of Competency – Examination) Regulation 1970	11
2.1.1.7	Factories and Machinery (Notification, Certificate of Fitness and Inspection)Regulation 1970	11
2.1.1.8	Factories and Machinery (Noise Exposure) Regulation 1989	12

2.2.0	Hazard Identification, Risk Assessment and Determining Control (HIRADC)	12
2.2.10	Hazard Identification	12
2.2.1.1	Types of Hazard	13
2.2.1.2	Hazard Identification	15
2.2.1.3	Hazard Identification and Assessment Methodology	16
2.2.2	Risk	16
2.2.2.1	Risk Assessment	16
2.2.2.2	Step to Conduct Risk Assessment	17
2.2.3	Risk Control	18
2.2.3.1	Elimination	20
2.2.3.2	Substitution	20
2.2.3.3	Isolation	20
2.2.3.4	Engineering Control	21
2.2.3.5	Administration Control	21
2.2.3.6	Personal protection Equipments (PPE)	21
2.2.3.7	Monitoring Controls	22
2.3	Design Questionnaire	22
2.3.1	Questionnaire	23
2.3.2	Description of the open format question	24
2.4	Statistical Package for the Social Sciences (SPSS) Software.	27
2.5	Summary	27
3. METHODOLOGY		
3.1	Project Overview	28
3.2	Planning of problem Statement, Objective and Scope	30
3.3	Preparing of the literature review	30
3.4	Developing of questionnaire	30
3.4.1	Delivery the questionnaire	31
3.4.2	Statistical Package for the Social Sciences (SPSS) Software.	32
3.5	Hazard Identification, Risk Assessment and Determining Control (HIRADC)	32
3.5.1	Hazard Identification	32
3.5.2	Risk Assessment	32

3.5.3	Significant aspect	33
3.6	Results	33
3.7	Discussion	34
3.8	Conclusion	34
3.9	Summary	34

4. COMPANY BACKGROUND

4.1	Scomi Engineering	36
-----	-------------------	----

5. RESULT AND DISCUSSION

5.1	Result for questionnaire	37
5.1.1	Result questionnaires: Upper management for Coach and Rail.	38
5.1.2	Result questionnaires: Production operator for Coach and Rail.	41
5.2	Aspect and Impact	44
5.2.1	Aspect and Impact for Rail	45
5.2.2	Aspect and Impact for Coach	47
5.3	Conducting HIRADC	48
5.3.1	HIRADC for Coach	49
5.3.2	HIRADC for rail.	51
5.4	Risk Assessment	54
5.4.1	Risk Assessment for Coach	55
5.4.2	Risk Assessment for Rail.	56
5.5	Discussion	59

6. CONCLUSION AND RECOMMANDATION

6.0	Conclusion and Recommendation	60
-----	-------------------------------	----

REFERENCES	61
-------------------	----

APPENDICES

A	Gantt chart for PSM I & II
---	----------------------------

B	Questionnaire
C	Aspect & Impact for Rail Area and Coach Area
D	HIRADC for Rail Area and Coach Area
E	Risk Assessment for Rail Area and Coach Area

LIST OF TABLES

2.1	Risk Assessment	19
2.2	Description of every risk action	20
2.3	Advantages and Disadvantages of Likert Question	29
5.1	Example of Aspect and Impact for bogie assembly	52
5.2	Example of Aspect and Impact for structure assembly	54
5.3	Hazard Identification for structure assembly department	57
5.4	Hazard Identification for body assembly department	60
5.5	Probability and Severity	58
5.6	Calculation of risk Assessment	59
5.7	Risk Assessment for structure Department	60
5.8	Risk Assessment for Bogie Assembly Department	62

LIST OF FIGURE

2.1	Firetube Boiler	8
2.2	Scotch Marine Boiler	9
2.3	Watertube Boiler circulation	10
2.4	Pendant and overhead crane	11
2.5	Physical Hazard	15
2.6	Biological Hazard	16
2.7	Chemical Hazard	16
2.8	Ergonomic hazard	17
3.1	Flow Chart of Methodology	32
5.1	Frequency chart of question 1 to 4 for upper management	41
5.2	Frequency chart of question 5 to 9 for upper management	42
5.3	Frequency chart of question 10 for upper management	43
5.4	Frequency Chart for question 1 to 4 for Coach.	44
5.5	Frequency Chart for question 1 to 4 for Rail.	44
5.6	Frequency Chart for question 5 to 10 for Coach.	45
5.7	Frequency Chart for question 5 to 10 for Rail.	46
5.8	Example of working at height	48
5.9	Example of knocking job.	51
5.10	Slippery flooring	55
5.11	Rotating part (gear)	56
5.12	Gear for rotating part	58

LIST OF ABBREVIATIONS

DOSH	-Department of Occupational Safety and Health
FMA	-Factories and Machinery Act
EMA	-Environmental Management System
ISO	-International Organization for Standard
HIRADC	-Hazard identification, Risk Assessment and Determining Control
SIRM	-Standard and Industrial Research Institute of Malaysia
OSHA	-Occupational Safety and Health Act
dB	-Decibel
PEL	- Permissible Exposure Limits
SPSS	- Statistical Package for the Social Sciences .

CHAPTER 1

INTRODUCTION

On 29 Mac 2008(Saturday) Department of Occupational Safety and Health was reported on the accident involving use gondola. The accident happen because of the safety lock which was supposed to be activated by locking onto the safety rope in the event of such slippage or breakage of the suspension rope was suspected to be not functioning. This scenario show that the workers not awareness in machineries aspect and this is the reasonable aspect contribute to the accident. Base on this case, it shown those factories and machineries acts are important to compliance by employer and employee to comply this act

This case study is about a compliance of manufacturing company with the Factories and Machineries Act (FMA) . It is carried out to help the company to achieve International Organizational for Standard ISO 14001. ISO 14001 is an Environmental Management System (EMS) based on the ISO 14000 standards is a management tool enabling an organization of any size or type to control the impact of this activities, products or services on the environment.

Besides that, this case study only carried out in workplace area only .The company shall followed the FMA to ensure the company will achieve the ISO 14001, nowadays most workers do not know about the purpose of FMA whereas they has no knowledge and no application of FMA . The workers need to educate on the importance of the FMA.

Therefore, evaluation this case study and the process improvement will use the Factory and Machinery Act (act 139) which is to guide the company achieve their objective and then some of the concept Hazard identification, Risk Assessment and Determining Control HIRADC will be used to identify the problem and proposed the new improvement to the company .

1.1 Problem Statement

This project is company need to get the ISO 14001 certificate this certificate is recommended by Standards and Industrial Research Institute of Malaysia SIRIM to certifications conditional upon satisfactory resolution of NCR issued. To achieve this certificate the company shall comply with the act. To comply with the act the company should apply the FMA. The main legal requirement that the company subscribes is Factory Machinery Act 1967 (Act 139) ,

1.2 Scope

This case study is focused to identify the company does and does not comply with the act, besides that the company comply with the act is base on the two areas only, there are coach, and rail. Base on the three areas working area are followed the Factories and Machinery Act 1967 (act 139). Other sections are not covered for the study.

1.3 Objective of Project

There are a few objectives that must be achieved in this project research:

- a) To study on compliance of Factory and Machinery Act 1967 at manufacturing company.
- b) To analyze the factory and machinery of work place.
- c) To proposed the new improvement to the company on areas related to the factories and machinery act.

1.4 Importance of the study

The study emphasizes on the factory and machinery in the workplace and it is importance due to obtain the ISO 14001 certificate. Other than that this study also will show to the company awareness of the act and also propose the new environment of working area .Moreover this study will help the company to achieve the ISO 14001 and also help the student to identify the hazard area based on the act .

1.5 Summary

This chapter is introducing the project background and the objective of the project. In addition, the problem statement and the scope of study also being clarify in order to limit the range of this project conduct. The following chapter consists of the literature review and knowledge that required in conducting the whole study.

CHAPTER 2

LITERATURE REVIEW

This chapter will discuss about the review that will use to explores the dominant themes includes study and research of publish material like journal, technical document and online library. Generally, the purposes of a review to analyze critical segment of a publish body of knowledge through summary, classification and comparison of prior case study, review of literature and theoretical article. Other than that, this chapter also will discuss topic that relate to a safety and the compliance of the rule and regulation of the Factory and Machinery Art (act 139) at the manufacturing company.

2.1.0 Introduction of Factories and Machinery

The factory definition is there must be premises involved, the boundaries of which can be define and within those premises there is manual labor going on in connection with one of the process specified. The process must be involve the making , altering , repairing , ornamenting , finishing , cleaning , washing , breaking up demolition or adapting for sale any article and the process must be carried on by trade or for gain . While the machinery can be describe as "an assembly, fitted with or intended to be fitted with a drive system other than directly applied human or animal effort, consisting of linked parts or components, at least one of which moves, and which are joined together for a specific application". Nowadays too many industrial sector was developed. Ensuring the factories and machinery to work smoothly a compliance to the act is needed

2.1.1 Factories and Machinery Act (act 139)

Factories and Machineries Act (FMA) came into force in 1967, to provide for the control of factories with respect to matters relating to safety, health and welfare of persons at work and to provide control on registration and inspection of machinery. FMA was approved by the Parliament of Malaysia in year 1967, in 1970 FMA and eight regulations under the act were enforced. This act was legislated to overcome the weaknesses in the Machinery Ordinance 1953; they were not protected if they are working in a workplace that doesn't use machinery. Factory and Machinery Act 1967 only covers occupational safety and health in the manufacturing, mining, quarrying and construction industries, whereas the other industries are not covered. In FMA also have fifteen regulations.

An act to provide for control of factories with respect to matters relating to the safety, health and welfare of person therein, the register and inspection of machinery and for matter connected therewith. FMA and The Occupational Safety and Health Act (OSHA) is enabling act it mean they were given power to minister to gazette details and regulations. FMA contains some general provisions on safety, health and welfare, the details provisions are stipulated under the regulations.

This case study will use 8 regulations from 15 regulations in this Factory Machinery Act 1967 (act137), there are:

- a) Factories and Machinery (Steam Boiler and Unfired Pressure Vessel) Regulations 1970
- b) Factories and Machinery (Electric Passenger and Goods Lift) Regulations 1970
- c) Factories and Machinery (Fencing of Machinery and Safety) Regulations 1970
- d) Factories and Machinery (Persons - In - Charge) Regulations 1970
- e) Factories and Machinery (Safety, Health and Welfare) Regulations 1970
- f) Factories and Machinery (Certificates of Competency - Examination) Regulations 1970
- g) Factories and Machinery (Notification, Certificate of Fitness and Inspection) Regulations 1970
- h) Factories and Machinery (Noise Exposure) Regulations 1989

2.1.1.1 Factories and Machinery (Steam Boiler and Unfired Pressure Vessel) Regulations 1970

This regulation was described about the essential of steam boiler and unfired pressured vessel.

a) Steam boiler

A boiler can be defining a closed vessel in which water or other fluid is heated under pressure. A steam boiler is a closed vessel containing water. Water in a steam boiler is pressurized and turned into a steam when heat is added. When a fuel is burned, the chemical energy in the fuel is transform on to the heat. This heat which is a form of energy is contained in the steam (Steingress,F.M *et al* 2003). More over steam boiler are generally classified as a low pressure steam boiler and high pressure steam boiler. However steam boiler can be classified as firutube steam boiler and watertube steam boiler .The type of steam boiler used in a particular application depends on the pressure, temperature and amount of steam required.

A low pressure steam boilers are used primarily for heating building such as schools, apartments, warehouses, factories and for heating domestic water .This boiler can be firetubes , watertube or cast iron sectional type. Boiler size will vary based on the quantity of steam required. A low pressure steam boiler has maximum allowable working pressure (MAWP) of 15 pounds per square inch (psi) . Besides that, for the high pressure (power) steam boiler are used in generating electricity an in industrial and commercial location where steam is used for processes other than heating . Paper mills used steam for dryers, pasteurizing and sterilizing facilities used steam generated by high pressure boiler in their process. A high pressure (power) steam boiler operates at pressure above 15 psi and over 6 boiler horse power (BHP). A boiler horse power is defined as the evaporation of 34.5 lb of water/hr from and at a feed water temperature of 212 °F.

In a firetube steam boiler heat and gases of combustion pass through tubes surrounded by water .Firetube steam boilers may be either low pressure or high pressure boilers. For the this boiler there have three types of firetube steam boilers, there are the horizontal return tubular boilers, scotch marine boiler and vertical

firetube boilers. All firetube boilers have same basic operating principles. The heat produced by gases combustion passes through the tubes while water surrounds the tubes. However firetube boilers have different design , based on application and installation consideration .

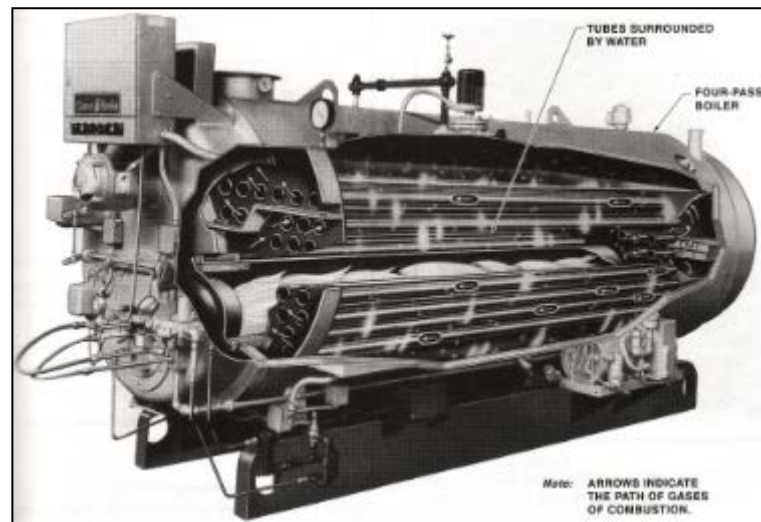


Figure 2.1: Firetube boiler (Steingress, F.M *et al* 2003)

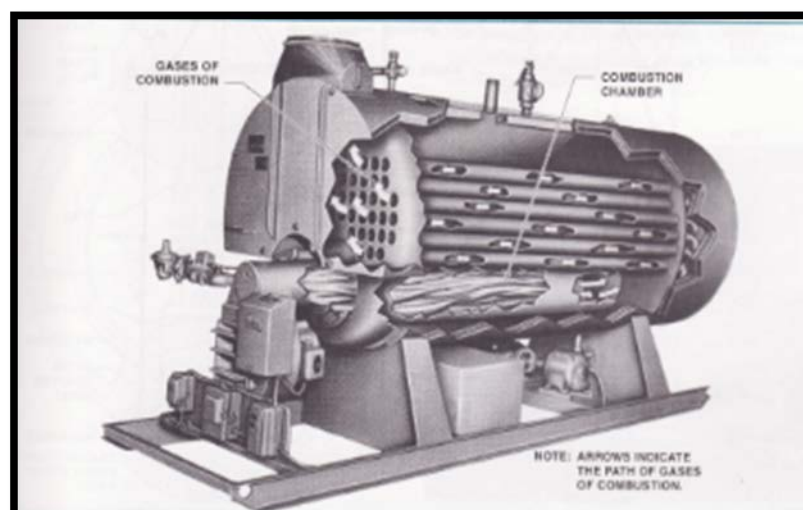


Figure 2.2: Scotch Marine Boiler. (Steingress, F.M *et al* 2003)

A watertube steam boiler has water inside the tubes . The heat and gases of combustion pass around the tubes are measured .Watertube boilers were develop as the rapid growth of industry prompted a need for steam at higher pressures and this boilers were designed to operated at pressures as high as 3206 psi , also known the critical pressure of steam . Critical pressure of steam is the point at which the density

of the water and steam is the same. The development of watertube boiler did not eliminate the need for firetube boilers in industry and watertube boilers types also vary depending on the style, shape and configuration of the tubes location of the drum.

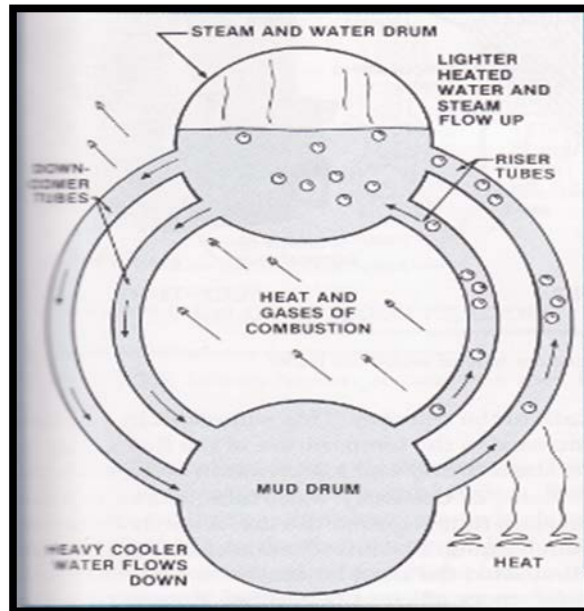


Figure 2.3: Watertube Boiler circulation . (Steingress, F.M *et al* 2003)

b) Unfired pressure vessel

A fired pressure vessel is separate category of vessel that includes power boiler and other design to accept heat. These parts were briefly focused on the unfired pressure vessel and explain about the air receiver, steam receiver and other. Other than that this part also telling about the regulation of essential safety fitting and further specifications.

2.1.1.2 Factories and Machinery (Electric Passenger and Goods Lift) Regulations 1970

This regulation was briefly about the regulation of electric passenger and good lift. According to the R.John *et al* 2003, the term lifting covers any equipment used the process of lifting loads or peoples and includes lift, crane, hoist, and lifting accessories that join the load to the crane. Definition of crane is any lifting machine

and associated parts where the movement of load is not restricted by guides and rail. This includes permanent fixed installations in building such as overhead travelling cranes, self contained cranes and hand-operated chain pulley blocks.

In industrial crane used for material handling which some material handling jobs cannot be handle by industrial truck , or large ,heavier, more awkward. Crane also used extensively in generally industry although they usually take a different form. Cranes in industrial plants are generally limited in travel by track or overhead runway structure, typified by over head traveling crane .Overhead crane is operated from the floor by mean of hanging cord control called of pendant , or from fixed remote station called a pulpit .

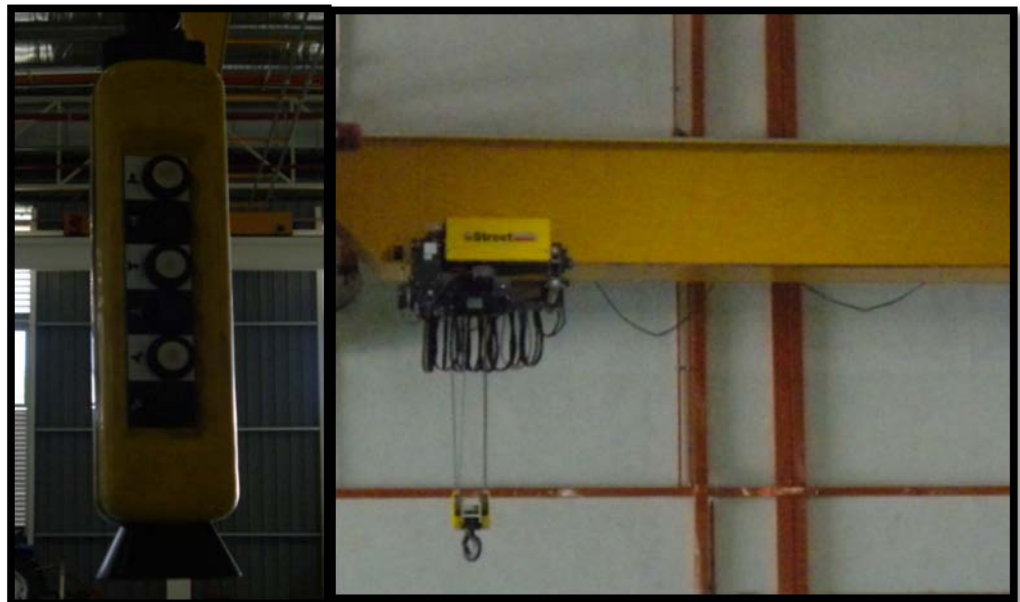


Figure 2.4: Pendant and overhead crane

All the new lifting machine (cranes , cab , winch) and lifting appliances (pulley and chain block) have a manufacturer's certificate specifying safe working load with design drawing and load calculations . Besides that, the applying electric passenger and good lift is to lift that are use to carry persons including goods lift. All the owner of lift should provide the detail design to obtain approval from the DOSH.

2.1.1.3 Factories and Machinery (Fencing of Machinery and Safety) Regulations 1970

These regulation was briefly describe about the safeguard of machinery, all dangerous parts of machine including the power sources and transmissions but be guarded. Besides that this regulation was describe about the specifies methods for guarding different type of machines. Despite wide differences between machines, some mechanical hazards seem to be shared in general. Fencing of machinery in this regulation is divided by two parts they are prime mover, transmission machinery and driven machinery. On the safety fencing have several type of fencing there are such as machinery using rolls, woodworking saws, planing machine, spindle moulding machine power press machining and so on.

2.1.1.4 Factories and Machinery (Persons - In - Charge) Regulations 1970

This regulation and rule was briefly about the person in charge, the specify persons in charge of certain machinery require certificate of competency including the steam boiler ,steam engine ,internal combustion engine and dredge . The purpose of person in charge is to ensure that the employee do the work properly by followed the working procedure.

2.1.1.5 Factories and Machinery (Safety, Health and Welfare) Regulations 1970

This regulation was explained about the safety, health and welfare that were deal with factory premises and various safety, health and welfare. Safe means of access and safe place of employment. This regulation was briefly about the safety, health and welfare that the manufacturing should provide to the company. Besides that, for example the company should provide for safety is about the first aid kit , the properly lighting to employee do the work , other than that for the welfare facilities should provided by company also, the example of welfare facilities such as toilet, drinking water, washing facilities and first aid kit .

2.1.1.6 Factories and Machinery (Certificates of Competency - Examination) Regulations 1970

This regulation was clearly briefly about the certificate of competency, the set up the framework for the certificate of competency required under Factories Machinery (Person in Charge) regulation. Besides that this regulation was laid down the pre-requisite for the application for a certificate of competency and the examination procedure and all the certificate of competency have requirements for experience and an examination pass before they can be granted. The certificate of competency can be suspended or cancelled if the holder is medically unfit or in case of serious misconduct or if judged unfit after an enquiry in a court.

2.1.1.7 Factories and Machinery (Notification, Certificate of Fitness and Inspection) Regulations 1970

This regulation clearly briefly the details of notification, certificate of fitness and inspection carried out by Department of Occupational Safety and Health DOSH. This part was described about the certificates of fitness that must be held for steam boiler, unfired pressure vessel. Inspection of every factory or machinery, the factory and machinery inspected at regular interval, the regular interval. The inspection fees charge by DOSH, .The fees that will be charge it is different fees for every inspection.

2.1.1.8 Factories and Machinery (Noise Exposure) Regulations 1989

Noise is unwanted sound; noise can cause a number of reactions in individuals ranging from fatigue through stress to complete disorientation (R. John *et. al.*,2002) .For the this regulation was briefly about the noise exposure at the factory, the permissible exposure level is divided to a several types, one of it, an equivalent continuous sound level 90 dB (A), noise close of unity, the maximum noise level of 115 dB (A) and then for the impulse noise not exceed 140 dB (A). Besides that method of

compliance is by engineering and/or administrative controls, the PPE is used if these are not practicable. Other than that the initial and ongoing monitoring for employees exposed permission exposure limit (PEL), and the hearing protection for employees exposed by the action level, by the way the hearing protection must attenuate noise level below PEL and limit for impulse noise.

2.2.0 Hazard Identification, Risk Assessment and Determining Control (HIRADC)

Hazard Identification, Risk Assessment and Determining Control (**HIRADC**) is a principles used in workplace to manage safety and health. The objectives of HIRADC are:, to identify types of hazard in work area, to make a risk assessment ,to suggest risk control organization , to implementation risk control and review risk control .

2.2.1.0 Hazard Identification

The meanings of hazards in different source, Hazard identification are a crucial part of the system safety process. It really is impossible to be safeguarding a system or control risk adequately without first identifying the hazard (Nicholas .J.B, 1997). According to (Charles D.Reese, 2009) hazard identification is a process controlled by management. Hazard identification includes those items that can assists with identifying workplace hazards and determining the corrective action necessary to control them.

The purpose of hazard identification is to highlight the critical operations of tasks, that is, those tasks posing significant risks to the health and safety of employees as well as highlighting those hazards pertaining to certain equipment due to energy sources, working conditions or activities performed. Hazards can be divided into three main groups, health hazards, safety hazards, and environmental hazards.