

OCCUPATIONAL FRAMEWORK SECTION C: MANUFACTURING DIVISION 27: MANUFACTURE OF ELECTRICAL EQUIPMENT



JABATAN PEMBANGUNAN KEMAHIRAN KEMENTERIAN SUMBER MANUSIA

Department of Skills Development Ministry of Human Resources

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ABSTRACT

An Occupational Framework (OF) is the outcome of the analysis conducted in identifying the work scope of the occupational areas in terms of competencies. It is used to analyse skilled manpower competency requirements for the industry. The OF aims to provide an overall view of the industry's Occupational Structure (OS) and identify skills gaps, critical job titles and Occupational Descriptions that would assist in further understanding the job requirements of the various occupations in the industry. Jabatan Pembangunan Kemahiran (JPK) or in English, the Department of Skills Development (DSD) is the custodian of this document, where via the OF will identify suitable occupational areas which will either require development of skills training programmes or the review and enhancement of existing skills training programmes. The findings of this research have shown that there are 6 main sub-sectors of the Electrical Manufacturing industry, which are Energy Converter (MSIC Group 271), Energy Equipment (MSIC Group 273), Electrical Energy Equipment (MSIC Group 279), Lighting Equipment (MSIC Group 274) and

Consumer Product (MSIC Group 275). A total of 85 job titles and 6 critical job titles have been identified in the job areas of Energy Converter, Energy Storage Device Design and Electrical Cables Design. There are 36 jobs related to Industry 4.0 starting from level 1 to level 6 of the Production job areas for each respective MSIC Group. The Skills In Demand that have been identified are such as Battery Assembly, Rectifier Design, Communication skills, Trouble shooting skills, Problem solving skills and Skills to escalate issues to superior. Emerging skills which are mainly related to Industry 4.0 (Utilisation and optimisation of automation systems and continuous improvement methods) are also seen to be in demand by the industry in the near future and should be embedded in the National Occupational Skills Standards (NOSS). In terms of NOSS to be developed, currently in the NOSS registry, most NOSS that have been developed focus on installation, maintenance and repair. Therefore there should be a development of the NOSS for the other job areas other than Energy Storage Device starting at the entry levels, level 1-3.

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LIST OF ABBREVIATIONS

СВТ	Competency Based Training		
DESCUM	Development of Standard and Curriculum		
ILB	Industry Lead Body		
E&E	Electrical & Electronics		
ISIC	International Standard Industrial Classification		
JPK	Jabatan Pembangunan Kemahiran (Department of Skills Development)		
MIDA	Malaysian Investment Development Authority		
MOSQF	Malaysian Occupational Skills Qualification Framework		
MQA	Malaysian Qualifications Agency		
MQF	Malaysian Qualifications Framework		
MSC	Malaysian Skills Certificate		
MSIC	Malaysia Standard Industrial Classification		
NCS	National Competency Standards		
NKEA	National Key Economic Areas		
NOSS	National Occupational Skills Standard		
OF	Occupational Framework		
OD	Occupational Description		
OS	Occupational Structure		
TEAMM	The Electrical and Electronics Association of Malaysia		

CHAPTER 1: INTRODUCTION

1.1 Chapter Introduction

Chapter 1 will provide an introduction to the research in terms of the research background, concept of the Occupational Framework, its function in skills training and curriculum development, project objectives, project scope and justification of the Occupational Framework for the Manufacture of Electrical Equipment.

1.1.1 Research Background

The Department of Skills Development (DSD) has conducted previous research on the Electrical Industry such as below:

- a. Occupational Job Structures for the Electrical Industry Sector (2009)
- b. Electrical and Electronics Industry (2015)

There has not been specific research on the Occupational Structure of the industry based on the Malaysian Standard Industry Classification (MSIC) definition of the industry which is the Manufacture of Electrical Equipment under Section C, which is manufacturing and Division 27, which is Manufacture of Electrical Equipment. Therefore this research aims to ensure that the development of the Occupational Framework is in line with the development of the NOSS based on MSIC sections and divisions.

1.1.2 National Skills Development Act, 2006 (Act 652)

The National Skills Development Act, 2006 (Act 652) came into effect on 1st September 2006 after it was officially gazetted on 29th June 2006, with the mandate of promoting, through skills training, the development and improvement of a person's abilities, which are needed for vocation, and to provide for other matters connected therewith. The Act 652 is significant because for the first time in the history of skills training in Malaysia, a national legislation has been enacted solely and exclusively for skills training and development. In addition, the meaning and scope of skills training have been clarified and given a statutory interpretation that can be used to distinguish it from other components of the country's national

education and training system. The Act 652 also provides for the implementation of a Malaysian Skills Certification System, leading to the award of five (5) levels of national skills qualification, namely Malaysian Skills Certificate Level 1, 2 and 3; Malaysian Skills Diploma; and Malaysian Skills Advanced Diploma.

1.1.3 Malaysian Qualifications Agency Act 2007 (Act 679)

The Malaysian Qualifications Agency Act 2007 (Act 679), which was adopted on the 29th August 2007, establishes the Malaysian Qualifications Agency, sets out its composition, functions and responsibilities. This act repeals the *Lembaga Akreditasi Negara* Act 1996 (Act 556) and dissolves the *Lembaga Akreditasi Negara*.

The Malaysia Qualifications Framework refers to the policy framework that satisfies both the national and international recognised qualifications. It consists of titles and guidelines, together with principles and protocols covering articulation and issuance of qualifications and statements of attainment. Elements of the qualifications framework indicate the achievement for each qualification title. It will also provide progression routes for all the graduates in the respective occupational fields.

The MQF has eight levels of qualifications in three sectors and it is supported by lifelong education pathways as shown in Figure 1.1. JPK governs the skills sector, in which there are five (5) levels of skills qualification. The definition for each level of skills qualification is specified in the Malaysian Occupational Skills Qualification Framework (MOSQF).

Sectors

MQF Levels	Skills	Vocational and Technical	Higher Education	Lifelong Learning
8			Doctoral Degree	
7			Master Degree	⊳
6			Bachelor Degree	CCr
5	Malaysian Advanced Skills Diploma	Advanced Diploma	Advanced Diploma	editation Learr
4	Malaysian Skills Diploma	Diploma	Diploma	of Pric ning (A
3	Malaysian Skills Certificate 3	Vocational and	Certificate	or Expe vPEL)
2	Malaysian Skills Certificate 2	Technical		erientia
1	Malaysian Skills Certificate 1	Contineate		<u>a</u>

Figure 1.1: Malaysian Qualifications Framework (MQF) Chart

(Source: Malaysian Qualifications Agency (MQA). 2013)

1.1.4 National Occupational Skills Standard (NOSS)

The National Occupational Skills Standard (NOSS) is defined as a specification of the competencies expected of a skilled worker who is gainfully employed in Malaysia for an occupational area, level and pathway to achieve the competencies and is gazetted in Part IV of the National Skills Development Act, 2006 (Act 652). NOSS is developed by industry experts based on the needs of the industry and is utilised as the main tool in the implementation of Malaysian Skills Certification System in which the performance of existing industry workers and trainees are assessed based on the NOSS to award the Malaysian Skills Certificate.

1.1.5 Competency Based Training (CBT)

Competency Based Training (CBT) is an approach to vocational training which emphasises what a person can do in a work place as a result of education and training obtained. CBT is based on performance standards which are set by the industry with main focus on measuring the performance while taking into account knowledge and attitude rather than the duration taken to complete the course. CBT is a learner-centric, outcome-based approach to training which allows each individual to develop skills at their own pace for a similar outcome. Thus, training practices can be customised for each individual to achieve a similar outcome. CBT concept is the basis of Malaysian Skills Certification system which is coordinated by JPK.

1.1.6 Occupational Framework (OF)

The Occupational Framework (OF) is the outcome of the occupational analysis process to identify the occupational structure of an industry. The OF which was previously known as Occupational Analysis (OA) consists of Occupational Structure (OS), Occupation Description (OD) and Skills in Demand.

The development of the OF is a preliminary process in developing relevant NOSS. Once developed, the NOSS can be used as the basis to conduct skills training and skills certification of competent personnel.

1.1.7 Malaysia Standard Industrial Classification (MSIC)

The MSIC is intended to be a standard classification of productive economic activities. Its main purpose is to provide a set of activity categories that can be utilised for the collection and presentation of statistics according to such activities. Therefore MSIC aims to present these set of activity categories in such a way that entities can be classified according to the economic activity that they carry out. For purposes of international comparability, the MSIC 2008 Version 1.0 conforms closely to the International Standard Industrial Classification of All Economic Activities (ISIC) Revision 4, published by the United Nations Statistics Division, with some modifications to suit national requirements. The objective of an industrial classification system is to classify data in respect of the economy according to categories of activities and the characteristics of which will be similar. The MSIC is a classification of all types of economic activities and is not a classification of goods & services nor is it a classification of occupations.¹

1.2 Objectives Of Study

¹ MSIC 2008, Department of Statistics Malaysia.

The objectives of the study are as below:

- a. To produce the OS for the Electrical Equipment Manufacturing industry from data analysis, interviews and focus group;
- b. To identify Occupational Descriptions (OD) of job titles in the aforesaid OS;
- c. To identify the Skills in Demand in the Electrical Equipment Manufacturing industry; and
- d. To identify the Critical Jobs in the Electrical Equipment Manufacturing industry.

1.3 Scope Of Study

The scope of study conducted on the Electrical Equipment Manufacturing industry is as the following:

- a. To focus only on the manufacturing of Electrical Equipment, which will not include the retail and after sales services such as repair and maintenance of the electrical equipment.
- b. To conduct literature review on the Electrical Equipment Manufacturing industry;
- c. To consult with Electrical Equipment Manufacturing industry representatives to obtain expert input from industry;
- d. To produce OS, OD, Jobs in demand and Skills in demand;
- e. To develop and disseminate the survey, then to subsequently analyse survey responses from Electrical Equipment Manufacturing industry representatives; and
- f. To perform focus group discussion with the industry representatives, interviews, site visits and/or any other methods in order to achieve the study outcome.

1.4 Justification For MSIC Section Selection

The justification for the selection of MSIC's Section C, Manufacturing and Division 27 for this particular Occupational Framework is as the following:

- a. The scope of the Electrical Equipment Manufacturing industry matches that of Division
 27 under Section C: Manufacturing after analysing the scope of work and list of
 electrical equipment under the Groups of Division 27.
- b. The current NOSS registry (May 2018) has stated that the NOSS relevant to the industry are under Section C, Division 27.

In order to understand the co-relation between the scope of the MSIC groups in this particular research and industry definition provided by the Malaysian Investment

Development Agency (MIDA), Table 1.1 depicted the mapping between sub-sectors of the industry and the Groups under Section C's Division 27.

MSIC GROUP	MSIC Group Description	Industry Definition
271	Manufacture of electric motors, generators, transformers & electricity distribution and control apparatus	Boards, panels and consoles, switching apparatus, lamps, air conditioners, vacuum cleaners, ovens, transformers, cables & wires, primary cells & batteries, solar cells
272	Manufacture of batteries and accumulators	and modules.
273	Manufacture of wiring and wiring devices	
274	Manufacture of electric lighting equipment	
275	Manufacture of domestic appliances	
279	Manufacture of other electrical equipment	

Table 1.1: Mapping between MSIC Group and Industry	y Definition

1.5 Chapter Conclusion

The research background of this study has been elaborated in this chapter. It is important for the reader to initially understand the legislations that are pertinent to this document (i.e. National Skills Development Act 2006 (Act 652) and Malaysian Qualifications Agency Act 2007 (Act 679)), the Malaysian Qualifications Framework (MQF), definitions of the NOSS, OF and Competency Based Training. All of which are important elements of skills training in Malaysia. The objectives, scope and justification of this research have also been explained in this chapter. This research aims to define the industry (as specified in the MSIC) based on qualitative research on its Occupational Structure, Jobs in Demand and Skills in Demand.

Based on earlier consultation via the Focus Group Discussions, the occupational structure or career path is similar between the different sub-sectors or MSIC Groups, where the entry level are as Operators at level 2 for workers under the production job area, as Technical Executives at level 4 under the Design job area and as Quality Assurance Inspectors at level 4 under the Quality Assurance job area. However, further analysis has been done and presented in Chapter 4 of this report. Through earlier discussions with members of the industry and document analysis, the common skills in demand are such as;

- a. Communication skills;
- b. Troubleshooting and problem solving skills; and
- c. Escalation of issues to superior.

Emerging skills identified are such as Industry 4.0 related skills (i.e. automation and ability to utilise, maintain and optimise systems related to Industry 4.0) and innovation for continuous improvement (i.e. Kaizen skills).

It is envisaged that via the Occupational Framework analysis findings, the job scopes of the workers in this industry are more defined and enriched with details of skills, knowledge and attributes as required by the industry, therefore allowing employers and other industry stakeholders to properly plan the required training for the workforce.

CHAPTER 2: LITERATURE REVIEW

2.1 Chapter Introduction

The objectives of this chapter are to provide an overview of the current and existing legislations, governing the manufacturing of electrical equipment in Malaysia and the ecosystem of the industry, which includes government initiatives, policies, related regulatory requirements and key stakeholders.

2.2 Definition of Research Area

The scope of the Electrical Equipment Manufacturing sector of the Occupational Framework research is defined in the following subsections.

2.2.1 Classification Under MSIC 2008

Under MSIC 2008, Electrical Manufacturing falls under the Section C-Manufacturing, Division 27-Manufacture of Electrical Equipment. This section consists of Group 271, 272, 273, 274, 275 & 279.

2.2.2 Classification Under Malaysian Investment Development Authority (MIDA)

Malaysian Investment Development Authority definition of Electrical sub-sector of the E&E industry in Malaysia can be categorised as in Table 2.1.

Sectors	Sub-Sectors	Products
		Semiconductors, passive components,
	Components	printed circuit boards, metal stamped
		parts and precision plastic parts
		Audio visual products such as television
	Consumer	receivers, Portable Multimedia Players
Floctronics	Consumer	(PMP), speakers, cameras and electronic
Electronics		games
		Multimedia and information technology
		products such as computers and
	Industrial	computer peripherals,
		telecommunications equipment and office
		equipment.
		Boards, panels and consoles, switching
Electrical		apparatus, lamps, air conditioners,
	Electrical	vacuum cleaners, ovens, transformers,
		cables & wires, primary cells & batteries,
		solar cells and modules

Table 2.1: MIDA Industry Definition

(Source: Malaysian Investment Development Authority (MIDA). 2018)

It necessary to mention that the Electronics Products Manufacturing Sector will be further researched in the Occupational Framework study on Division 26 of the MSIC Section C, Manufacturing and will not be focused in this particular OF study.

2.3 Scope of Occupational Framework Based On MSIC 2008

The following table 2.2 to 2.9 describe the various levels and scope of MSIC 2008 which will be used for the Occupational Framework development of the Manufacturing of Electrical Equipment.

MSIC SECTION	С	MANUFACTURING	
MSIC DIVISION	27	MANUFACTURE OF ELECTRICAL EQUIPMENT	
	271	Manufacture of electric motors, generators, transformers & electricity distribution and control apparatus	
	272	Manufacture of batteries and accumulators	
MSIC GROUPS	273	Manufacture of wiring and wiring devices	
	274	Manufacture of electric lighting equipment	
	275	Manufacture of domestic appliances	
	279	Manufacture of other electrical equipment	
MSIC Class:	2710 ⁽¹⁾	Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	
MSIC Item:	27101	Manufacture of electric motors, generators and transformers ⁽²⁾	

Table 2.2: MSIC Division 27 - Manufacture of Electrical Equipment

(1) Excludes:

- (a) manufacture of electronic component-type transformers and switches, see 26102
- (b) manufacture of environmental controls and industrial process control instruments,
- (c) manufacture of switches for electrical circuits (e.g. pushbutton and snap switches),
- (d) manufacture of electric welding and soldering equipment, see 27900
- (e) manufacture of solid state inverters, rectifiers and converters, see 27900
- (f) manufacture of turbine-generator sets, see 2811
- (g) manufacture starting motors and generators for internal combustion engines

(2) Includes:

- (a) manufacture of distribution transformers, electric
- (b) manufacture of arc-welding transformers
- (c) manufacture of fluorescent ballasts (e.g. transformers)
- (d) manufacture of substation transformers for electric power distribution
- (e) manufacture of electric motors (except internal combustion engine starting motors)

- (f) manufacture of power generators
- (g) manufacture of motor generators sets (except turbine generator set units)
- (h) manufacture of prime mover generator sets

Table 2.3: MSIC Group 271- Manufacture of Electric Motors, Generators,Transformers and Electricity Distribution and Control Apparatus

MSIC SECTION	С	MANUFACTURING
MSIC DIVISION	27	MANUFACTURE OF ELECTRICAL EQUIPMENT
MSIC GROUP	271	Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus
MSIC Class	2710	Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus
MSIC Item	27102	Manufacture of electricity distribution and control apparatus ⁽¹⁾ 31200p

(1) Includes:

(a) manufacture of transmission and distribution voltage regulators

(b) manufacture of power circuit breakers

(c) manufacture of control panels for electric power distribution

(d) manufacture of electrical relays

(e) manufacture of duct for electrical switchboard apparatus

(f) manufacture of electric fuses

(g) manufacture of power switching equipment

(h) manufacture of electric power

(i) rewinding of armatures on a factory basis

Table 2.4: MSIC Group 272 - Manufacture of Batteries and Accumulators

MSIC SECTION	С	MANUFACTURING	
MSIC DIVISION	27	MANUFACTURE OF ELECTRICAL EQUIPMENT	
MSIC GROUP	272	Manufacture of batteries and accumulators	
MSIC Class	2720	Manufacture of batteries and accumulators	
MSIC Item	27200	Manufacture of batteries and accumulators ⁽¹⁾ 31400p	
(1) Includes:			
(a) manufacture of non-rechargeable and rechargeable batteries			
(b) manufacture of primary cells and primary batteries			
(c) manufacture of electric accumulators, including parts thereof			
(d) manufacture of lead acid batteries			
(e) manufacture of NiCad batteries			
(f) manufacture of lithium batteries			
(g) manufacture of dry cell batteries			

- (h) manufacture of wet cell batteries
- (i) manufacture of other types of batteries and accumulators n.e.c.

Table 2.5: MSIC Group 273 - Manufacture of Wiring and Wiring Devices

MSIC SECTION	С	Manufacturing
MSIC DIVISION	27	MANUFACTURE OF ELECTRICAL EQUIPMENT
MSIC GROUP	273	Manufacture of wiring and wiring devices
MSIC Classes	2731 ⁽¹⁾ 2732 ⁽²⁾	Manufacture of fibre optic cables Manufacture of other electronic and electric wires and cables
MSIC Items	27310 27320	Manufacture of fibre optic cables 31301p Manufacture of other electronic and electric wires and cables 31302p

(1) Includes: manufacture of fibre optic cables for data transmission or live transmission of images

Excludes:

- (a) manufacture of glass fibres or strand, see 23109
- (b) manufacture of optical cable sets or assemblies, see depending on application,

(2) Includes: manufacture of insulated wire and cable, made of steel, copper, and aluminium

Excludes:

- (a) manufacture (drawing) of wire, see 24102, 24104, 24109, 24209
- (b) manufacture of computer cables, printer cables, USB cables and similar cable sets or assemblies, see 26109
- (c) manufacture of cable sets, wiring harnesses and similar cable sets or assemblies for automotive applications, see 29300

Table 2.6: MSIC Group 274 - Manufacture of Electric Lighting Equipment

	MSIC SECTION	С	Manufacturing
	MSIC DIVISION	27	MANUFACTURE OF ELECTRICAL EQUIPMENT
	MSIC GROUP	274	Manufacture of electric lighting equipment
	MSIC Class	2740 ⁽¹⁾	Manufacture of electric lighting equipment
MSIC Items	27400	Manufacture of electric lighting equipment	
		31500р, 31900р	

(1) Includes:

- (a) manufacture of electric light bulbs and tubes and parts and components
- (b) manufacture of lighting fixtures
- (c) manufacture of non-electrical lighting equipment
- (d) manufacture of lighting fixture components (except current-carrying wiring devices)
- (e) manufacture of lighting equipment for motor vehicles, ships, aircraft

Excludes:

- (a) manufacture of glassware and glass parts for lighting fixtures, see 23109
- (b) manufacture of current-carrying wiring devices for lighting fixtures, see 27330
- (c) manufacture of ceiling fans or bath fans with integrated lighting fixtures
- (d) manufacture of electrical signalling equipment such as traffic lights and pedestrian signalling equipment, see 27900

Table 2.7: MSIC Group 275 - Manufacture of Domestic Appliances

MSIC SECTION	С	Manufacturing
MSIC DIVISION	27	MANUFACTURE OF ELECTRICAL EQUIPMENT
MSIC GROUP	275	Manufacture of domestic appliances
MSIC Class	2750 ⁽¹⁾	Manufacture of domestic appliances
MSIC Item	27500	Manufacture of domestic appliances 29300

(1) Includes:

- (a) manufacture of refrigerators, freezers
- (b) manufacture of dishwashers, washing and drying machines
- (c) manufacture of vacuum cleaners, floor polishers, waste disposers
- (d) manufacture of grinders, blenders, juice squeezers, tin openers, electric shavers and other electric personal care device
- (e) manufacture of ventilating or recycling hoods
- (f) manufacture of ceiling fans or bath fans with integrated lighting fixtures
- (g) manufacture of electric water heater, electric blankets, electric hair dryers, electric smoothing irons, household-type fans, electric ovens, microwave ovens, cookers, hotplates, toasters, coffee or tea makers, fry pans, roasters, grills, electric heating
- (h) manufacture of non-electric space heaters, cooking ranges, grates, stoves, water heaters, cooking appliances, etc.
- (i) manufacture of other household and domestic electric appliances n.e.c.

Excludes:

- (a) manufacture of commercial and industrial refrigerators and freezers, room airconditioners, attic fans, permanent mount space heaters and commercial ventilation and exhaust fans, commercial type cooking equipment; commercial-type laundry, dry-cleaning, and pressing equipment; commercial, industrial and institutional vacuum cleaners, see division 28
- (b) manufacture of household-type sewing machines, see 28260
- (c) installation of central vacuum cleaning systems, see 43294

Table 2.8: MSIC Group 279 - Manufacture of Other Electrical Equipment

MSIC SECTION	С	Manufacturing	
MSIC DIVISION	27	MANUFACTURE OF ELECTRICAL EQUIPMENT	
MSIC GROUP	279	Manufacture of other electrical equipment	
MSIC Class	2790 ⁽¹⁾	Manufacture of other electrical equipment	
(1) Excludes:			
(a) manufacture of po	orcelain el	ectrical insulators, see 23930	
(b) manufacture of c	arbon and	d graphite fibres and products (except electrodes and	
electrical applicat	ions), see	23990	
(c) manufacture of e	lectronic d	component-type rectifiers, voltage regulating integrated	
circuits, power o	converting	integrated circuits, electronic capacitors, electronic	
resistors and simi	ilar device	s, see 26102, 26103	
(d) manufacture of tra	ansformer	s, motors, generators, switchgear, relays and industrial	
controls, see 271	0		
(e) manufacture of ba	atteries, se	ee 27200	
(f) manufacture of co	f) manufacture of communication and energy wire, current-carrying and non-current-		
carrying wiring de	carrying wiring devices, see 27330		
(g) manufacture of lig	ghting equ	ipment, see 27400	
(h) manufacture of he	ousehold-t	ype appliances, see 27500	
(i) manufacture of no	on-electric	al welding and soldering equipment, see 28199	
(j) manufacture of r	notor veh	icle electrical equipment (e.g. generators, alternators,	
spark plugs, ignit	ion wiring	harnesses, power window and door systems, voltage	
regulators), see 2	regulators), see 29300		
(k) manufacture of r	nechanica	al and electromechanical signalling, safety and traffic	
control equipmer	nt for rai	lways, tramways, inland waterways, roads, parking	
facilities, airfields,	facilities, airfields, see 30200		

Table 2.9: MSIC Group 279 - Manufacture of Other Electrical Equipment

MSIC SECTION	С	Manufacturing	
MSIC DIVISION	27	MANUFACTURE OF ELECTRICAL EQUIPMENT	
MSIC GROUP	279	Manufacture of other electrical equipment	
MSIC Class	2790	Manufacture of other electrical equipment	
MSIC Item	27900	Manufacture of miscellaneous electrical equipment other than motors, generators and transformers, batteries and accumulators, wires and wiring devices, lighting equipment or domestic appliances ⁽¹⁾	

(1) Includes:

- (a) manufacture of battery charges, solid-state
- (b) manufacture of door opening and closing devices, electrical
- (c) manufacture of electric bells
- (d) manufacture of extension cords made from purchased insulated wire
- (e) manufacture of ultrasonic cleaning machines (except laboratory and dental)
- (f) manufacture of solid state inverters, rectifying apparatus, fuel cells, regulated and unregulated power supplies
- (g) manufacture of uninterruptible power supplies (UPS)
- (h) manufacture of surge suppressors (except for distribution level voltage)
- (i) manufacture of appliance cords, extension cords, and other electrical cord sets with insulated wire and connectors
- (j) manufacture of carbon and graphite electrodes, contacts, and other electrical carbon and graphite products
- (k) manufacture of particle accelerators
- (I) manufacture of electrical capacitors, resistors, condensers and similar components
- (m) manufacture of electromagnet
- (n) manufacture of sirens
- (o) manufacture of electronic scoreboards
- (p) manufacture of electrical signs
- (q) manufacture of electrical signalling equipment such as traffic lights and pedestrian signalling equipment
- (r) manufacture of electrical insulators (except glass or porcelain), base metal conduit and fittings
- (s) manufacture of electrical insulators equipment and component ofinternal combustion engines

- (t) manufacture of electrical welding and soldering equipment, including hand-held soldering irons, soldering guns
- (u) manufacture of tanning beds
- (v) manufacture of other electrical equipment n.e.c.

2.4 Key Stakeholders

The stakeholders for the Manufacture of Electrical Equipment in Malaysia comprise of government agencies, regulatory bodies and industry associations professional bodies of Electrical Equipment' manufacturers.

2.4.1 Regulatory Bodies And Relevant Government Agencies

The regulatory bodies for the Electrical Equipment manufacturing industry are similar to the electronic products manufacturing industry because both are under the economic area targeted by the government for development which is the E & E industry, however there are some variances such as for the Electrical Equipment Manufacturing industry the safety of the products must be monitored the Energy Commission. The regulatory bodies and relevant government agencies for this industry are described in Table 2.10.

No	Government	Relevance to Electrical Equipment
	Agency/Regulatory	Manufacturing Industry
	Agency/Licensing Body	
1.	Malaysian Investment	In terms of the Electrical Equipment
	Development Authority (MIDA)	manufacturing industry, MIDA's role is to
	(Website:	promote foreign and local investments,
	http://www.mida.gov.my)	planning for industrial development, to
		recommend policies and strategies on
		industrial promotion and development, to
		evaluate applications for manufacturing
		licenses, and expatriate posts; tax
		incentives for manufacturing activities, and

Table 2.10: List of Government Agencies/Regulatory Agencies/Licensing Bodies

No	Government	Relevance to Electrical Equipment
	Agency/Regulatory	Manufacturing Industry
	Agency/Licensing Body	
		duty exemption on raw materials,
		components and machinery.
		MIDA also assists companies in the
		implementation and operation of their
		projects, and offers assistance through
		direct consultation and co-operation with
		the relevant authorities at both the Federal
		and State levels.
2.	Energy Commission	The Energy Commission is responsible for
	(Website:	regulating the energy sector, specifically
	https://www.st.gov.my)	the electricity and piped gas supply
		industries in Peninsular Malaysia and
		Sabah. The Electrical Manufacturing
		industry will refer the EC when obtaining
		approval for products or parts that have
		been imported or will be exported in order
		to fulfil safety requirements of the EC.
3.	Atom Energy Licensing Board	The Electrical Equipment Manufacturing
	(AELB)	industry will refer the AELB when
	(Website:	obtaining approval for products or parts
	http://portal.aelb.gov.my)	that have been imported or will be
		exported in order to fulfil safety
		requirements.
4.	Malaysian Communications	Specifically for the Electrical Equipment
	and Multimedia Commission	manufacturing industry, MCMC is referred
	(MCMC)	to in terms of licensing of the products as
	(Website:	stipulated in the Communications and
	https://www.skmm.gov.my)	Multimedia (Technical Standards)
		Regulations2000, Regulation 14 - "All
		communications equipment which are
		required to be certified under these
		Regulations shall be so certified."

No	Government	Relevance to Electrical Equipment
	Agency/Regulatory	Manufacturing Industry
	Agency/Licensing Body	
		MCMC's Scope of Certifications include:
		 Communication Equipment; Electricity Safety Electromagnetic Immunity & Compatibility Network Interoperability Wireless Light Wave Apparatus Cabling Facilities and Systems
5.	Department of Occupational Safety and Health (DOSH) (Website: http://www.dosh.gov.my)	The Department of Occupational Safety and Health (DOSH) is responsible for ensuring the safety, health and welfare of people at work as well as protecting other people from the safety and health hazards. DOSH will ensure that the safety and health regulations are adhered to by companies in the Electrical Equipment Manufacturing industry.
6.	Department of Environment (DOE) (Website: https://www.doe.gov.my)	The Electrical Equipment Manufacturing industry is under the monitoring and enforcement of DOE in terms of environmental quality. The main function of the DOE is to prevent, eliminate, control pollution and improve the environment, consistent with the Environmental Quality Act 1974 and regulations under DOE ² .

² Source from: https://www.doe.gov.my/portalv1/en/tentang-jas/pengenalan/perkhidmatan-teras

No	Government	Relevance to Electrical Equipment
	Agency/Regulatory	Manufacturing Industry
	Agency/Licensing Body	
7.	SIRIM BERHAD	SIRIM is also responsible in the testing
	(Website:	and validation of products from the
	http:www.sirim.my)	Electrical Equipment manufacturing
		industry and that they meet the particular
		requirements to be certified.
8.	SIRIM QAS International Sdn.	SIRIM QAS International is an accredited
	Bhd.	certification, inspection and testing
	(Website: http://www.sirim-	services provider under numerous bodies,
	qas.com.my)	including the National Accreditation Body,
		the Department of Standards Malaysia
		(STANDARDS MALAYSIA) and the United
		Kingdom Accreditation Service (UKAS)
		among others ³ .
9.	Bureau Veritas	Bureau Veritas is responsible for activities
	(Website:	in Testing, Inspection and Certification
	http://www.bureauveritas.com)	(TIC), where for the Electronics and
		Electrical Manufacturing industry these
		include:
		Certification of Management systems
		and second party audit services.
		• Testing, inspection and certification of
		consumer goods in the Electrical &
		Electronics industry.

³ Source from: https://www.doe.gov.my/portalv1/en/tentang-jas/pengenalan/perkhidmatan-teras

2.4.2 Professional Bodies and Industry Associations

The list of industry associations as shown in Table 2.11, are their respective categories of organisations, which are promoting their interests and facilitate close collaboration between their member organisations towards strengthening the industry.

		Relevance to Electrical
No	Industry Association	Equipment Manufacturing
		Industry
1.	Institute of Electronics and Electrical	The IEEE is responsible for
	Engineers (IEEE)	research publication, technical
	(Website: https://ieeemy.org)	standards and guidelines,
		technical conferences, various
		magazines and publications.
		Featuring many societies and
		chapters, the IEEE has a very
		broad range of coverage ⁴ .
2.	Federation of Malaysian	The Federation of Malaysian
	Manufacturers (FMM)	Manufacturers (FMM) is
	(Website: http://www.fmm.org.my)	Malaysia's premier economic
		organisation. It now represents
		over 3,000 manufacturing and
		industrial service companies of
		varying sizes, the FMM is the
		officially recognised and
		acknowledged voice of the
		industry ⁵ .
3.	The Electrical and Electronics	The association, is one of the
	Association of Malaysia (TEEAM)	representative bodies of the
	(Website: http://www.teeam.org.my)	electrical and electronic industry
		in Malaysia. It works closely with
		government departments,

|--|

 ⁴ Source from: https://ieeemy.org/students/
 ⁵ Source from: http://www.fmm.org.my/About_FMM-@-About_FMM.aspx

		Relevance to Electrical
No	Industry Association	Equipment Manufacturing
		Industry
		statutory bodies and the private
		sector to ensure and encourage
		the growth of the electrical and
		electronic industry.
4.	International Electrotechnical	The International
	Commission (IEC)	Electrotechnical Commission
	(Website:	publishes consensus-based
	http://www.iec.ch/about/activities/?ref=	International Standards and
	menu)	manages conformity assessment
		systems for electric and
		electronic products, systems and
		services, collectively known as
		electrotechnology. IEC
		publications serve as a basis for
		national standardization and as
		references when drafting
		international tenders and
		contracts.

2.5 Government Legislations, Policies and Initiatives

Legislations 2.5.1

Table 2.12 below are the relevant legislations for the overall manufacturing industry, which related to the manufacturing of electrical equipment.

No	Areas of Acts	Name of Act	Function and Relevance
	are related to		of Act
1.	Acts related to	Occupational Safety	This Act is for securing the
	manufacturing	and Health Act 1994	safety, health and welfare of
	(In general)	(Act 514)	persons at work, for
			protecting others against
			risks to safety or health in
			connection with the activities
			of persons at work. The
			regulatory body for this Act
			is Department of
			Occupational Safety and
			Health (DOSH) ⁶ .
		Environmental Quality	An Act relating to the
		Act 1974 (Act 127)	prevention, abatement,
		Environmental Quality	control of pollution and
		(Amendment) Act	enhancement of the
		2012 (ACI A 1441)	environment, and for
			purposes connected
			therewith ⁷ .
		Factories and	An Act to provide for the
		Machinery Act 1967	control of factories with
		(Act 319) / Factories	respect to matters relating to
		and Machinery Act	the safety, health and
		(Amendment) 2006	welfare of person therein,
			the registration and

Table 2.12: List of Relevant Legislations

 ⁶ Source from: http://www.dosh.gov.my/index.php/en/legislation/acts.
 ⁷ Source From: https://www.ecolex.org/details/legislation/environmental-quality-act-1974-no-127-of-1974-lexfaoc013278/.

are related to of Act Image: Section of machinery and for matters connected therewith ⁰ . inspection of machinery and for matters connected therewith ⁰ . 2. Acts related to regulating the safety of electrical equipment used in domestic residences and offices Fire Services Act and efficient functioning of the Fire Services Department, for the protection of persons and property from fire risks and for purposes connected therewith. Renewable Energy Act 2011 (Act 725) An Act to provide for the establishment and implementation of a special tariff system to catalyse the generation of renewable energy and to provide for related matters. Street, Drainage and Building Act 1974 (Act 133) A legal instrument that establish procedures for building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By-Laws are provided under this act. Construction Industry Development Board An Act to establish the Lembaga Pembangunan Industry Pembingaan	No	Areas of Acts	Name of Act	Function and Relevance
2. Acts related to regulating the safety of electrical equipment used in domestic residences and offices Fire Services Act An Act to make necessary provision for the effective and efficient functioning of the Fire Services Renewable Energy Act 2011 (Act 725) Department, for the protection of persons and property from fire risks and for purposes connected therewith ⁻ Renewable Energy Act 2011 (Act 725) An Act to provide for the establishment and implementation of a special tariff system to catalyse the generation of renewable energy and to provide for related matters. Street, Drainage and Building Act 1974 (Act 133) A legal instrument that establish procedures for building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act. Construction Industry Development Board Malaxsia 1984 (Act An Act to establish the Lembaga Pembangunan Industri Pembinaan		are related to		of Act
2. Acts related to regulating the safety of electrical equipment used in domestic residences and offices Fire Services Act 1988 (Act 341) An Act to make necessary provision for the effective and efficient functioning of the Fire Services Department, for the protection of persons and offices Property from fire risks and for purposes connected therewith ⁻ Renewable Energy Act 2011 (Act 725) An Act to provide for the establishment and implementation of a special tariff system to catalyse the generation of renewable energy and to provide for related matters. Street, Drainage and Building Act 1974 (Act 133) A legal instrument that establish procedures for building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act. Construction Industry Development Board Malaxsia 1984 (Act An Act to establish the Lembaga Pembangunan Industri Pembinaan				inspection of machinery and
2. Acts related to regulating the safety of electrical equipment used in domestic residences and offices Fire Services Act 1988 (Act 341) An Act to make necessary provision for the effective and efficient functioning of the Fire Services Department, for the protection of persons and offices Property from fire risks and for purposes connected therewith ⁻ Renewable Energy Act 2011 (Act 725) An Act to provide for the establishment and implementation of a special tariff system to catalyse the generation of renewable energy and to provide for related matters. Street, Drainage and Building Act 1974 (Act 133) A legal instrument that establish procedures for building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act. Construction Industry Development Board Malavsia 1984 (Act An Act to establish the Lembaga Pembangunan Industri Pembinaan				for matters connected
2. Acts related to regulating the safety of electrical equipment used in domestic residences and offices Fire Services Act 1988 (Act 341) An Act to make necessary provision for the effective and efficient functioning of the Fire Services Note the fire Services Department, for the protection of persons and property from fire risks and for purposes connected therewith Renewable Energy Act 2011 (Act 725) An Act to provide for the establishment and implementation of a special tariff system to catalyse the generation of renewable energy and to provide for related matters. Street, Drainage and Building Act 1974 A legal instrument that establish procedures for building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act. Construction Industry Nalaysia 1994 (Act An Act to establish the Lembaga Pembangunan Industri Pembinaan				therewith ⁸ .
regulating the safety of electrical equipment used in domestic residences and offices Renewable Energy Act 2011 (Act 725) Street, Drainage and Building Act 1974 (Act 133) Herek Act 2011 Industry Renewable Energy Act 2011 Act 725 Construction Industry Act 2012 An Act to establish the Lembaga Pembangunan Industri Pembinaan Provision for the effective and efficient functioning of the Fire Services Department, for the protection of persons and property from fire risks and for purposes connected therewith An Act to provide for the establishment and implementation of a special tariff system to catalyse the generation of renewable energy and to provide for related matters.	2.	Acts related to	Fire Services Act	An Act to make necessary
safety of electrical equipment used in domestic residences and offices Renewable Energy Act 2011 (Act 725) Street, Drainage and Building Act 1974 (Act 133) A resuble Act 2014 A resu		regulating the	1988 (Act 341)	provision for the effective
electrical equipment used in domesticthe Fire Services Department, for the protection of persons and property from fire risks and for purposes connected therewithRenewable Energy Act 2011 (Act 725)An Act to provide for the establishment and implementation of a special tariff system to catalyse the generation of renewable energy and to provide for related matters.Street, Drainage and Building Act 1974 (Act 133)A legal instrument that establish procedures for building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act.Construction Industry Development Board Malaysia 1994 (ActAn Act to establish the Lembaga Pembangunan Industri Pembinaan		safety of		and efficient functioning of
equipment used in domestic residences and officesDepartment, for the protection of persons and property from fire risks and for purposes connected therewith·Renewable Energy Act 2011 (Act 725)An Act to provide for the establishment and implementation of a special tariff system to catalyse the generation of renewable energy and to provide for related matters.Street, Drainage and Building Act 1974 (Act 133)A legal instrument that establish procedures for building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act.Construction Industry Development Board Malaysia 1994 (ActAn Act to establish the Lembaga Pembangunan Industri Pembinaan		electrical		the Fire Services
in domestic residences and offices Renewable Energy Act 2011 (Act 725) Act 2011 (Act 725) An Act to provide for related matters. Street, Drainage and Building Act 1974 (Act 133) A legal instrument that establish procedures for building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act. Construction Industry Development Board Malaysia 1994 (Act Industri Pembinaan		equipment used		Department, for the
residences and offices Renewable Energy Act 2011 (Act 725) An Act to provide for the establishment and implementation of a special tariff system to catalyse the generation of renewable energy and to provide for related matters. Street, Drainage and Building Act 1974 (Act 133) A legal instrument that establish procedures for building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act. Construction Industry Malaysia 1994 (Act Malaysia 1994 (Act		in domestic		protection of persons and
officesfor purposes connected therewithRenewable Energy Act 2011 (Act 725)An Act to provide for the establishment and implementation of a special tariff system to catalyse the generation of renewable energy and to provide for related matters.Street, Drainage and Building Act 1974 (Act 133)A legal instrument that establish procedures for building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act.Construction Industry Development Board Malaysia 1994 (ActAn Act to establish the Lembaga Pembangunan Industri Pembinaan		residences and		property from fire risks and
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 implementation of a special tariff system to catalyse the generation of renewable energy and to provide for related matters. Street, Drainage and Building Act 1974 Kate 133) A legal instrument that establish procedures for building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By-Laws are provided under this act. Construction Industry An Act to establish the Lembaga Pembangunan Malaysia 1994 (Act 			Act 2011 (Act 725)	establishment and
tariff system to catalyse the generation of renewable energy and to provide for related matters.Street, Drainage and Building Act 1974A legal instrument that establish procedures for building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act.Construction Industry Development BoardAn Act to establish the Lembaga Pembangunan Industri Pembinaan				implementation of a special
generation of renewable energy and to provide for related matters.Street, Drainage and Building Act 1974A legal instrument that establish procedures for building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act.Construction Industry Development BoardAn Act to establish the Lembaga Pembangunan Industri Pembinaan				tariff system to catalyse the
 energy and to provide for related matters. Street, Drainage and Building Act 1974 A legal instrument that establish procedures for building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act. Construction Industry Development Board Malaysia 1994 (Act 				generation of renewable
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Street, Drainage and Building Act 1974A legal instrument that establish procedures for building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act.Construction Industry Development BoardAn Act to establish the Lembaga Pembangunan Industri Pembinaan				related matters.
Building Act 1974establish procedures for(Act 133)building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act.Construction Industry Development BoardAn Act to establish the Lembaga PembangunanMalaysia 1994 (ActIndustri Pembinaan			Street, Drainage and	A legal instrument that
 (Act 133) building plan approvals and other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act. Construction Industry An Act to establish the Development Board Malaysia 1994 (Act 			Building Act 1974	establish procedures for
other construction development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act. Construction Industry Development Board Malaysia 1994 (Act			(Act 133)	building plan approvals and
development and control methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act. Construction Industry Development Board Malaysia 1994 (Act Industri Pembinaan				other construction
methods. Uniform Building By-Laws 1984 and later By- Laws are provided under this act. Construction Industry Development Board Malaysia 1994 (Act				development and control
By-Laws 1984 and later By- Laws are provided under this act. Construction Industry Development Board Malaysia 1994 (Act Industri Pembinaan				methods. Uniform Building
Laws are provided under this act. Construction Industry An Act to establish the Development Board Lembaga Pembangunan Malaysia 1994 (Act Industri Pembinaan				By-Laws 1984 and later By-
this act.Construction IndustryAn Act to establish theDevelopment BoardLembaga PembangunanMalaysia 1994 (ActIndustri Pembinaan				Laws are provided under
Construction IndustryAn Act to establish theDevelopment BoardLembaga PembangunanMalaysia 1994 (ActIndustri Pembinaan				this act.
Development Board Lembaga Pembangunan Malaysia 1994 (Act Industri Pembinaan			Construction Industry	An Act to establish the
Malaysia 1994 (Act Industri Pembinaan			Development Board	Lembaga Pembangunan
			Malaysia 1994 (Act	Industri Pembinaan
520) <i>Malaysia</i> , also known as the			520)	Malaysia, also known as the
Malaysian Construction				Malaysian Construction

⁸ Source from: http://www.dosh.gov.my/index.php/en/legislation/acts

No	Areas of Acts	Name of Act	Function and Relevance
			Industry Development Board
			(CIDB), and to provide for its
			functions relating to the
			construction industry and for
			matters connected.
3.	Acts related to	Atomic Energy	These acts are related to
	radioactive	Licensing Act 1984	the licensing of materials or
	equipment	(Act 304)	equipment used by the
		 Akta Zon Ekonomi 	Electrical equipment
	Ei Pe	Ekslusif 1984:	manufacturing industry that
		Perintah Zon	may consist of radioactive
		Ekonomi Ekslusif	substances or either emit
		(Pemakaian Akta	radioactive waves. These
		Perlesenan Tenaga	licenses are also used to
		Atom) 1990 - (Malay	allow these items that are
		Version)	either imported or exported.
4.	Acts related to	 Communications 	These acts are relevant to
	electrical	and Multimedia Act 1998 (Act 588) • Malaysian	the regulation of
equ	equipment used		manufactured
	in	Communications	communications equipment
	communications	and Multimedia	
	Comm 1998 (Lommission Act 1998 (Act 589)	

2.5.2 Government Policy And Initiatives

The current economic plans, which are the 3rd Industrial Master Plan (IMP3) and the 11thMalaysia Plan (RMK11) are still relevant and remain as Malaysia's midterm policy guide until 2020. RMK11 (2016-2020) has identified the three (3) catalytic (E&E, M&E and Chemical) plus two (2) new growth (Aerospace and Medical Devices) sectors as game changers for the manufacturing sector. These sectors will continue as the focus sector together with other sectors such as automotive, petrochemicals, textiles and services. As the number of high-quality investments rise and new growth areas spring up, so too will the demand for highly skilled workers, thereby raising the nation's income levels. Malaysia has a wide variety of incentives covering the major industry sectors. Tax incentives can be granted through income exemption or by way of allowances. The major tax incentives for companies investing in the manufacturing sector are the Pioneer Status and the Investment Tax Allowance. Eligibility for Pioneer Status and Investment Tax Allowance is based on certain priorities, including the level of value-added, technology used and industrial linkages.

There are various types of incentives available in Malaysia for areas of Research & Development (R&D), Automation and Green Technology. These incentives are important to further encourage these activities to be conducted by industry players. For companies that provide or conduct R & D in manufacturing they will be eligible for tax exemption and Investment Tax Allowance (ITA)⁹.

There are also incentives for manufacturing companies with increased use of automation where they have incurred expenditure in automation equipment used directly in the manufacturing activities and resulting in reduced man hours and increased productivity. Manufacturing companies that have been in operation for at least 36 months are eligible for automation capital allowance.

⁹ Source from http://taxsummaries.pwc.com/ID/Malaysia-Corporate-Tax-credits-and-incentives

2.6 Industry and Market Intelligence

This section provides relevant information on the electrical equipment manufacturing industry.

2.6.1 Industry Economic Growth

The E&E industry which includes the electronics and electrical manufacturing industry, plays a crucial role in driving the Malaysian economy and has become a main contributor to Malaysia's Gross Domestic Product (GDP) in recent years while creating more than 780,000 jobs for Malaysians. The E&E Multinational Companies in Malaysia have been identified as a catalyst to develop local SMEs into high-value corporations. The Malaysian National Export Council (NEC) has identified Electrical & Electronics (E&E) as the key sector to promote the inclusion of Malaysian companies in the global supply chain, given its significance in developing new industries that are driven by knowledge, high-technology and added-value.

Below is a summary of recent statistics obtained from MIDA's 2017 Investment Performance Report regarding the E&E industry's performance in the year 2017.

- a. Attracted RM8.2 billion, or 84.5% of all investments in the industry, mostly from Singapore, Netherlands, Japan, and Germany
- b. Brought in the second-greatest amount of total investments which was RM9.7 billion across 109 projects compared to 107 projects amounting to RM9.2 billion in investments in the year 2017. Out of the 109 projects approved, 20 new projects brought in investments of RM1.4 billion, while 89 expansion/diversification projects had investments worth RM8.3 billion.
- c. The sixth-largest receiver of domestic funds (RM1.5 billion).
- d. The country's largest export earner in 2017, totalling RM343 billion and accounting for 36.7 per cent of the total value of exports.

Based on data from the Department of Statistics, Malaysia's economy grew by 4.5% in the second quarter this year, slower than the first quarter growth 5.4%. The declines in Agriculture and Mining & quarrying sectors have weighed down the overall performance of GDP. Nevertheless, the Services sector has supported the
economic growth, while Manufacturing and Construction sectors continued to register favourable growth during the quarter.¹⁰



Figure 2.1: GDP by Kind of Economic Activity

(Source: Department of Statistics Malaysia. 2018)

Figure 2.2 below shows Malaysia's Industrial Production Index (IPI) which has increased by 1.1% in June 2018 as compared with the same month of the previous year. The increase in June 2018 was supported by the growth in Manufacturing index (4.5%) and the Electricity index (3.0%). The major sub-sectors which registered increases in June 2018 were: Electrical and Electronic Equipment Products (5.4%), Textiles, Wearing Apparel, Leather & Footwear (6.1%), Wood Products, Furniture, Paper Products and Printing (5.4%).

¹⁰ Source from: Department of Statistics, Malaysia. 17 October 2018.

https://www.dosm.gov.my/v1/index.php?r=column/cthemeByCat&cat=100&bul_id=U0oyNStDWTh6R29rN2kwZz dxcStnQT09&menu_id=TE5CRUZCblh4ZTZMODZlbmk2aWRRQT09



Note:

YOY: Year-on-Year

MOM: Month-on-Month (Seasonally Adjusted)

Figure 2.2: Malaysia's Industrial Production Index (IPI))

(Source: Department of Statistics Malaysia. 2018)

2.6.2 Employment Statistics

According to Economic Transformation Programme (ETP), the projected Gross Net Income (GNI) for the manufacturing industry in Malaysia by the year 2020 is estimated to earn 42,235.30 million and jobs in demand are projected to be 151,201 jobs.



Figure 2.3: Manufacturing Industry Statistics for Number of Employees and Salaries and Wages

(Source: Department of Statistics Malaysia. 2018)

Data from the Department of Statistics Malaysia (DOSM) was referred to gauge the employment statistics in the year 2018. Figure 2.3 shows that the Manufacturing sector recorded RM 3,856.7 million (10.2% of all industries) of salaries & wages in June 2018. It also shows that there was an employment of 1,070, 776 persons (2.2%). Based on the Manufacturing Industry's sales value recorded an increase of 7.8 % which was RM67.1 billion (7.8%). Compared to data recorded in May 2018, there has been an increase in terms of sales value, employment and salaries paid, therefore it can be said that these elements are linear to each other meaning with the increase of sales value, the number of employment and salaries will increase to support the demand and business ramp up. ¹¹



YOY: Year-on-Year

Q1, Q2, Q3, Q4: Quarter 1, Quarter 2, Quarter 3, Quarter 4

Figure 2.4: Malaysia's Labour Productivity Statistics for 1st Quarter 2018

(Source: Department of Statistics Malaysia. 2018)

¹¹ Ministry of International Trade and Industry. Market Profiles. Pharmaceuticals. http://www.miti.gov.my/miti/resources/13._Pharmaceutical_Industry_.pdf

Labour productivity in the Manufacturing sector rose 3.3% (Q4 2017: 3.7%) at RM108,670. During this quarter, value added grew 5.3 per cent (Q4 2017: 5.4%) while employment increased 2.0 per cent (Q4 2017: 1.7%).¹² This can be seen in the Figure 2.4 above obtained from the DOSM website.

2.6.3 The E & E Industry And The 4th Industrial Revolution (Industry 4.0)

The term 'Fourth Industrial Revolution' is used to describe the emergence of the Digital Economy and the application of automation and data exchange in industrial technologies. (*Stated by German economist, Klaus Schwab in 2015*). Commonly referred to with the catchphrase Industry 4.0. It also included the Internet of Things and collaboration between networked machines and human beings in decision-making. Figure 2.5 below depicts the progression of the industry revolutions:



Figure 2.5: Industry Revolution Progression

(Source: Malaysian Digest. 2016)

Industry 4.0 is a technological revolution, which starts from the First Industrial Revolution to the Third Industrial Revolution. Briefly, the First Industrial Revolution used water and steam power to mechanise production. The Second used electric power to create mass production. The Third used electronics and information

¹² Department of Statistics Malaysia. Labour productivity of First Quarter

²⁰¹⁸https://www.dosm.gov.my/v1/index.php?r=column/cthemeByCat&cat=438&bul_id=TUM0R0pHRTd4ZkVSM EZQWkIRbFYxQT09&menu_id=Tm8zcnRjdVRNWWlpWjRlbmtlaDk1UT09

technology to automate production. The Fourth Industrial Revolution is building on the Third, the digital revolution that has been occurring since the middle of the last century. It is characterised by a fusion and convergence of technologies that cut across the physical, digital, and biological spheres.

According to the Malaysian Ministry of International Trade and Industry (MITI), the main pillars of Industry 4.0 which actually reflect more on the different technologies used in an Industry 4.0 environment, are as shown in the following Figure 2.6:



Figure 2.6: Main Pillars of Industry 4.0 implementation

(Source: www.eknowledge.com.my. 2018)

Malaysia's electrical equipment manufacturing industry is still functioning between industry 2.0 (mass production) and 3.0 (automation). However it is important for

the industry to progress as the move to lessen on low-skilled/foreign workers dependency is crucial for a more long term and sustainable workforce. Adopting new technology to ensure companies be more efficient and productive will be in tandem with global trends. Cheap labour is unsustainable in the long run and prone to human errors thus reducing the quality of products produced. The adoption of Industry 4.0 in this type of organisation will increase efficiency and promote zero-defect outputs. A study by The Boston Consulting Group has stated that rapid adoption of Industry 4.0 could boost labour productivity by as much as 30 % by 2024¹³.

The manufacturing sector continues to evolve as a response to the advancement in technologies today, with more companies adopting new ICT and industrial automation innovations to stay ahead.

Through the industry survey and site visits, the research team will be able to gauge the level of Industry 4.0 implementation specifically in the electrical manufacturing industry where this will be presented in chapter 4 of this report.

Examples of Industry 4.0 technologies that may be implemented in the Electrical Manufacturing industry are listed below by Festo Group¹⁴.

- a. Electric automation solutions
- b. Cloud based control technology
- c. IoT Gateways
- d. Sensors and actuators technology
- e. Industry 4.0 energy management to reduce energy and control central operating parameters automatically
- f. Vision systems

¹³ MITI. Industry 4.0. FAQ. www.miti.gov.my

¹⁴ Festo is a leading world-wide supplier of automation technology and the performance leader in industrial training and education programs.

The following Figure 2.7 shows the plus points and limitations of Industry 4.0 in the Electrical Manufacturing Industry.

Industry 4.0 in the E & E Industry PLUS POINTS OF INDUSTRY LIMITATIONS IN IMPLEMENTING 4.0 **INDUSTRY 4.0** Lessens low-skilled/foreign Costs involved in the upgrading of systems related to Industry 4.0 workers dependency in the and up-skilling of existing staff. manufacturing sector. Return of Investment (ROI) of Companies will be more investments required in efficient and productive in implementing Industry 4.0 tandem with global trends. technologies Rapid adoption of Industry The upgrading of the company's 4.0 could boost labour manpower where they will be productivity ->30 % by 2024 required to have a shift of skills (Boston Consulting Group) set and will also be required to

Require the synergy of the industry and government agencies in order to facilitate the implementation of Industry 4.0 in the near future and in the long run.

Figure 2.7: Plus Points and Limitations of Industry 4.0 Implementation in the Electrical Manufacturing Industry

2.6.4 Investment In The Malaysian Electrical Industry

Figure 2.8 shows the total of approved investments for the E & E industry in 2017 was RM 9.7 Billion with the investment for the Electrical Equipment sub-sector at 11.5% with a total of RM 1,114 million. However the highest total of investments was for Electronic Components (43.7%) and Industrial Electronics (43.7%).



Figure 2.8: Approved Investments in the E&E Industry by Sub-Sector for 2017

(Source: MIDA Investment Performance Report. 2017)

In 2017, the investments approved in the electrical sub-sector was RM1.1 billion, which totalled up to 30 projects. The investments were mainly FDIs, which was RM865 million (78%), while DDI was RM248 million (22%). These projects were expected to generate employment opportunities for 1,992 people.

2.6.5 Issues & Challenges

The issues highlighted by panel members are listed below:

- a. Manpower skills gap in electrical manufacturing
- b. User preference on electrical equipment in the market
- c. Regional competition in terms of market price, quality and innovations

In order to overcome these challenges companies must take strategic actions, which may comprise of up-skilling of manpower, use cost effective manufacturing solutions, use Industry 4.0 and produce value added products to attract customers.



Figure 2.9: Issues and Challenges of the Electrical Equipment Manufacturing Industry

2.7 List of National Occupational Skills Standards (NOSS) Relevant To MSIC Section C, Group 27: Manufacture of Electrical Equipment National Occupational Skills Standards (NOSS) developed by Jabatan Pembangunan Kemahiran (JPK) that is relevant to the Group 27: Manufacture of Electrical Equipment is listed in Table 2.13 below:

MSIC Group	Corresponding NOSS/ Level
271 Manufacture of Electrical Equipment	EE-212-5:2013 Solar Panel Manufacturing Management (30-12-2013) EE-212-4:2013 Solar Panel Manufacturing Control (30-12-2013) EE-212-3:2013 Solar Panel Manufacturing Operation (Thin Film Module) (30-12-2013)

Table 2.13: Manufacture of Electrical Equipment related NOSS

(Source: NOSS Registry May 2018 Jabatan Pembangunan Kemahiran (JPK). 2018)

2.8 Chapter Conclusion

Based on the literature review, the stakeholders in the industry comprising of government agencies, such as MIDA, AELB, DOE, DOSH, EC, are responsible in the development and monitoring of the industry in terms of compliance to the relevant acts and regulations. The main industry associations that associated with the Electrical Manufacturing industry are FMM, TEAMM, IEEE and IEC. The legislations mentioned in the sections of this Chapter, are those related to manufacturing in general, such as safety, environmental and for the purpose of import/export permits.

Due to the advancement of technologies in the industry and the requirement of new skills sets of the workforce, it is vital that the occupational areas are to be reviewed and redefined in the Occupational Structure. This is to accommodate the emerging skills required, such as, which is related the 4th Industrial Revolution. The need of emerging skills of 4.0 IR, need to be expedited, as the Malaysia's electrical equipment manufacturing industry is still functioning between Industry 2.0 and 3.0, which mass production and automation respectively. Adopting 4.0 IR technologist important to ensure companies be more efficient and productive will be in tandem with global trends.

Categorisation of the industry based on the Malaysia Standard Industrial Classification (MSIC) has to be taken into consideration, in particular under the Section C: Manufacturing, Division 27: Manufacture of Electrical Equipment under MSIC. The following chapter elaborates on the research approach used throughout the OF study.

In terms of economic growth the electrical; manufacturing industry is one of the main contributors to Malaysia's Gross Domestic Product (GDP), which has created more than 780,000 jobs. The Multinational Companies (MNCs) is a catalyst to develop local SMEs into higher level corporations. As reported by MIDA, in 2017, the combined E & E industry has attracted RM 8.2 billion of international investments, whilst the sixth-largest receiver of domestic funds, i.e. RM1.5 billion.

CHAPTER 3: METHODOLOGY

3.1 Chapter Introduction

This chapter describes the methodology used in the occupational analysis process for the purpose of developing the Electrical Equipment Manufacturing Occupational Framework (OF).

3.2 Overall Approach

In this study, qualitative analysis was selected as the main method of obtaining and analysing the necessary input in view of the Electrical Equipment Manufacturing industry's Occupational Framework and the types and sources of information required to develop the occupational framework.

Qualitative analysis was selected as the method of research because it investigates the reasons behind the decision making process, it requires smaller but more focused samples and it focuses on thematic reasoning on the meanings of the subject matter rather than the statistical significance of the occurrence.

This process uses inductive reasoning, by which themes and categories emerge from the data through the researcher's careful examination and constant comparison. This study uses a combination of the following methods to gather information:

- a. Document analysis;
- b. Focus Group Discussion (FGD) workshops; and
- c. Survey Analysis.

Figure 3.1 shows the development process or operational framework of the Electrical Equipment Manufacturing OF.



Figure 3.1: Operational Framework of Research

3.2.1 Document Analysis

a. Data Collection Strategies

Document analysis or literature review was done to obtain an overview of the Electrical Equipment Manufacturing Industry in terms of Industry Definition, Stakeholders, Acts and Industry Intelligence. Sources of information were such as those published by the government, regulatory and professional bodies, news agencies, research agencies and any other sources relevant to the background information of the Electrical Equipment Manufacturing industry. Most information obtained was mainly on the larger industry, which was either the Manufacturing Industry or the Electrical and Electrical (E&E) Industry rather than specific info on the Electrical Industry. Details of the sources for the

documents reviewed can be referred in the Reference section of this report, but generally the documents referred during the document analysis phase were as follows:

- i. Department of Statistics Malaysia, Economic Census Report 2016
- ii. Department of Statistics Malaysia data on Employment and Industry Productivity
- iii. MIDA Investment Performance 2017 Report
- iv. MITI Frequently Asked Questions (FAQ) on Industry 4.0
- v. NOSS Registry May 2018
- vi. Malaysia Standard Industrial Classification (MSIC) 2008
- vii. Online newspaper/magazine articles
- viii. Official websites of industry stakeholders and legislations
- ix. Etc.(as listed in the references section of this report)

b. Analyses

Document Analysis was done on the documents relevant to the required information in this research such as industry overview, stakeholders, legislations, Industry 4.0, government policies and industry intelligence. The relevance of the documents and reliability were based on the source of information and organisation of that aforesaid document. The documents were also selected based on how widely they were cited by other researchers.

c. Outcome

The outcome of this process is an overall view of the industry as described in Chapter 2 which includes the list of stakeholders (i.e. Regulatory bodies, related government agencies, certification organisations, industry associations), legislations, policies and initiatives, industry and market intelligence, MSIC scope of section and groups, plus the list of developed NOSS relevant to the Electrical Equipment Manufacturing industry.

3.2.2 Focus Group Discussions (FGD)

a. Data Collection Strategies

The Focus Group Discussion (FGD) meeting with the development panel members was conducted to confirm the findings obtained during document analysis, to review the draft questionnaire form in order to gauge the response of the industry and obtain industry intelligence information such as issues and challenges and use of Industry 4.0. This is because there is certain information for the industry intelligence section that is not available in the form of available literature.

Facts obtained during the literature review were discussed and presented to the Development Panel members, comprising representatives from various sectors of the industry in focus group workshop sessions for their review and confirmation. Sessions with MIDA and MITI were also conducted to further confirm if the findings are in line with government policies and initiatives.

NO	NAME	POSITION	ORGANISATION	MSIC Code
4	Azizam Bin Abu Bakar	Senior	Johnson Controls Hitachi	C275
1.		Engineer	Sdn. Bhd.	0215
0	l oke Koon Wah	Production	APM Auto Electric	C271
Ζ.		Manager	SdnBhd	0271
3.	Ismail Bin Abu Talib	Manager	Arbex Corp (M) SdnBhd	C272
			Technical Southern	
4.	Zen Azhar Bin Shuib	Manager	Cable EdgBbd	C273
5.	Christopher Rajaselvan	Director	Puncak Eviro Sdn. Bhd.	C274
_	Michael Maniyarasu	Charmon	Gumi Asli Elektrikal Sdn.	0074
6.	Sanjeevi	Chargeman	Bhd.	6274
7	Saiffulsam Bin Hassan	Senior	SIRIM Berbad	C27
1.	Samusan Dir Hassan	Engineer		021
0	Aida Syukrena Binti Mohd.	Senior	Sectoral Policy	C27
δ.	Idris	Principal		021

Table 3.1: List of Focus Group Discussion Panel Members

		Assistant	Ministry of International	
		Director	Trade and Industry	
			(MITI)	
			Electrical & Electronics	
		Senior	Division,	
9.	Norhizam Bin Ibrahim	Deputy	Malaysian Investment	C27
		Director	Development Authority	
			(MIDA)	

The dates, venue and activities of the industry engagement sessions involving industry players, government agencies and subject matter experts are as below:

No.	Date	Venue	Outcome	
1.	21 st -22 nd April 2018	Palace of the Golden Horses, Seri Kembangan.		
2.	3 rd May 2018	Malaysian Investment Development Authority (MIDA) Headquarters, Kuala Lumpur Sentral.	 Chapter 2: 1. Industry Stakeholders 2. Relevant Legislations and Government Policies 3. Industry Definition and MSIC Scope 4. Relevant NOSS 5. Industry Intelligence 	
3.	8 th May 2018	Malaysian International Trade and Industry (MITI) office		

Table 3.2: List of Industry Engagement Sessions

No.	Date	Venue	Outcome	
			Chapter 4:	
			1. Occupational Structure	
			2. Occupational Descriptions	
			3. Skills in Demand	
	$9^{\text{th}}-10^{\text{th}}$	Palace of the	4. Jobs in Demand	
4.	June	Golden Horses,	5. Emerging Skills	
	2018	Seri Kembangan.		
			Chapter 5:	
			1. Recommendations	
			2. List of Critical Jobs	

b. Analyses

The information collected regarding organisation structures were analysed during the focus group discussion when determining the Occupational Structure, whereas, the Occupational Descriptions were analysed together with the panel members.

i. Occupational Structure (OS) Development

The OS for the Electrical Equipment Manufacturing industry was developed by the facilitator and focus group by referring types of products in electrical manufacturing which is according to the respective MSIC Groups. Then each job area is further divided by the main common jobs for each MSIC Group. The figure below depicts the overall OS development. This OS will be included in the questionnaire to be reviewed by the survey respondents. The figure below depicts the overall OS development.

RELEVANT MSIC SECTION

Identification of industry scope and boundaries with other relevant industries : MSIC as main source of reference , further confirmed by the industry panel

Identification of Job Areas :

Figure 3.2: Overall Occupational Structure (OS) Development Process

The identification of the industry scope is important so that when identifying the relevant sub-sectors and areas under the industry, it will define the segmentation of the particular industry. This will eliminate the possibility of duplication between common areas.

The facilitator for this OF has taken the approach of having the rule of thumb in avoiding duplication of the organisation chart as this will include other areas such as marketing, administration, human resources and public relations. These areas are common across various industries and have a different set of skill sets. Grouping and segmentation based on similar skill sets in terms of technical abilities that are unique to the particular industry is a determining factor. The MSIC and existing OS in the DSD NOSS Registry were also used as a point of reference.

Job areas which are related to the respective MSIC Groups were identified based on the different types of electrical equipment. These job areas were also segmented based on the common job areas in various types of companies.

ii. Occupational Description (OD) Development

In the development of OD, facilitators have the flexibility in choosing which techniques or methods to be used. The OD is the general description of the main job scope of a particular job. The OD is developed using a combination of brainstorming sessions with panel members and then the OD would be compared to other available descriptions of the same job. Below are the main steps in producing an OD for the respective occupation titles:

- Determine the main areas and sub-areas in the sub-sector;
- Identify the occupational titles; and
- Identify the job scope.

To describe the OD clearly, the statement must consist of a Verb, Object and Qualifier. The rationale of determining the description attributes is to facilitate NOSS development especially in job and competency analysis.

c. Outcome

The outcome from the FGD and Industry Engagement Sessions are presented in Chapter 2 (Literature Review), Chapter 4 (Findings) and Chapter 5 (Discussions, Recommendations and Conclusions) with the breakdown as listed below:

3.2.3 Industry Survey and Questionnaire

a. Data Collection Strategies

Initially in the project, several research questions are developed in order to guide the research to arrive at a certain hypotheses. These questions are important to ensure that the research is focused and not broad-based. Therefore, the following questions have been formulated and will be used as a guide throughout the industry survey and interviews.

i. What is the Occupational Structure applied in various types of organisations in the industry.

- ii. List and justify the Critical Jobs in various types of organisations (i.e. SME, MNC) in the industry.
- iii. List and justify the Skills in Demand in various types of organisations (i.e. SME, MNC) in the industry.
- iv. Identify and describe the job scope of the occupational areas highlighted for this particular industry.

It In order to develop the questionnaire, a draft of the Occupational Structures, Skills in Demand and Emerging Skills were identified and developed together with the development panel. The questionnaire consists of 4 questions to solicit information from industry practitioners regarding the topics below:

- i. Question 1: Occupational Structure sample and comments on sample OS developed in FGD.
- ii. Question 2: Jobs in Demand and justification
- iii. Question 3: Skills in Demand and justification
- iv. Question 4: Emerging Skills and Justification

The target group for the survey is the organisation's Human Resource or higher management representatives. The survey aimed to obtain information on the common occupational structures used in various organisations, their job scopes, skills gap and emerging skills required.

The targeted number of industry survey respondents was 30 companies, which consist of 5 companies for each MSIC Group.

MSIC			NO. OF
SECTION	С	MANUFACTURING	TARGETED
SECTION			RESPONDENTS
MSIC	27	MANUFACTURE OF ELECTRICAL	
DIVISION		EQUIPMENT	
	271	Manufacture of electric motors,	5
		generators, transformers and	
		electricity distribution and control	
		apparatus	
	272	Manufacture of batteries and	5
		accumulators	
MSIC	273	Manufacture of wiring and wiring	5
GROUP		devices	
	274	Manufacture of electric lighting	5
		equipment	
	275	Manufacture of domestic appliances	5
	279	Manufacture of other electrical	5
		equipment	
	Total N	umber of Targeted Respondents	30

Table 3.3: Number of Targeted Respondents According to MSIC Group

b. Outcome

A sample of the questionnaire can be referred in Annex 3: Questionnaire in this report. The surveys were conducted to obtain the views of a wider group of industry representatives. However, there were limitations in carrying out the survey as not many of the respondents responded to the survey in a timely manner. Therefore, the number of targeted respondents could not be met. In order to overcome this limitation, the research team had to combine the data from available survey responses to document analysis available on the internet.

The survey was distributed online via email and followed up through phone calls to the respective Human Resource Department of the companies. The list of survey respondents were provided by MIDA and panel members' recommendations.

3.2.4 Validation of Research Findings by Review Committee

The research findings and final draft of the OF Document is to be presented to the Review Panel at the Occupational Framework Technical Evaluation Committee meeting for their comments and approval before it is to be submitted to JPK. The details for these sessions can be referred in Table 3.3. After obtaining approval from JPK, the document will be handed over to industry stakeholders in the final session of the research. The review and final handover session aims to finalise the OF research project by having the final meeting with industry stakeholder representatives to be briefed on the contents and findings of the research.

No.	Date	Venue	Activity
			Pre JTPOF Evaluation
1	7 th May 2018	NOSS Division, Level 3, JPK	meeting with JPK officers
	7 100 2010	Cyberjaya	to review formatting and
			standard content
2	16 th May	Palace of the Golden Horses,	1 st JTPOF Technical
Ζ.	2018	Seri Kembangan	Evaluation Meeting
з	30 th May	NOSS Division, Level 3, JPK	Steering Committee
0.	2018	Cyberjaya	(PEMANDU) meeting
Δ	12 th June	NOSS Division, Level 3, JPK	Steering Committee
т.	2018	Cyberjaya	(PEMANDU) meeting
5	8 th August	Palace of the Golden Horses,	2 nd JTPOF Technical
5.	2018	Seri Kembangan	Evaluation Meeting
6.	18 th	Palace of the Golden Horses	Hand Over to
	September	Sori Kombangan	Stakoboldore Monting
	2018	Gen Kenibaliyali	Stakenoluers weeting

Tahla	$3 1 \cdot 1$ ist	of Eva	aluation	Sessions
Iable	3.4. LISI		alualion	262210112

3.3 Chapter Conclusion

This chapter sets out the methodology used in the development of the OF for the Electrical Equipment Manufacturing Industry which includes the project approach, Occupational Structure development, Occupational Description development and list of industry engagements throughout the project.

As this project applies Qualitative Analysis methods to accomplish the research objectives, therefore industry engagements with industry representatives are an integral part of data collection. Basically, qualitative analysis is to understand the area of research, and the other hand quantitative analysis is to measure things. Qualitative analysis requires a holistic view and a fact-based overarching explanation.

Hence, qualitative data collection methods applied were using unstructured or semistructured techniques, which include focus groups discussions, individual interviews and industry visits. The sample size was typically small, and respondents are selected to fulfil a given quota.

The research questions posed in these industry engagements have been developed to solicit the required responses in a clear and structured manner. This can be seen in Annex 3: Questionnaire.

The findings of this study, i.e. the Occupational Structure, Occupational Definitions and the skills in demand are presented in the next chapter, Chapter 4, Findings and in Annex 4 of this report.

CHAPTER 4: FINDINGS

4.1 Chapter Introduction

This chapter will elaborate on the findings obtained via analysis of the Electrical Equipment Manufacturing Industry. The findings have been acquired via various sources such as literature review and engagement with the industry. Based on Focus Group Discussions, the Electrical Equipment Manufacturing Industry in Malaysia is categorised into 6 subsectors based on the products manufactured and MSIC Group segmentation:

- a. Energy Converter (MSIC Group 271)
- b. Energy Storage Devices (MSIC Group 272)
- c. Electrical Cables (MSIC Group 273)
- d. Lighting Equipment (MSIC Group 274)
- e. Consumer Product (MSIC Group 275)
- f. Electrical Energy Equipment (MSIC Group 279)

The scope of the analysis is based on 3 key areas, i.e. (a) the Occupational Structure (OS), (b) Jobs and Skills in Demand, and (c) the Occupational Description (OD). This chapter therefore highlights the findings gathered on these key areas.

4.2 Comparative Study Analysis

Below is a comparative analysis of the Electrical Manufacturing Industry according to each sub-sector as identified in this OF analysis. Each sub-sector is compared in terms of market definition, major companies, top countries and economic landscape. Based on the comparison done, the Consumer Products sub-sector has the largest market as there is a wider consumer base. The Energy Converter sub-sector is seen as a potential growth area for Asia, as stated in the literature review that Asia has surpassed Europe as the main contributor to the production of energy converters equipment. The profitability of individual companies depends on efficient operations, technological expertise, and effective marketing. Large companies have economies of scale in purchasing, production, marketing, and distribution. Small companies can compete by offering niche or specialty products, and through superior customer service.¹⁵

¹⁵ Dun & Bradstreet, 2018

Sub-sector	Market Definition	Major Companies	Top Countries	Economic Landscape
1. Consumer Electrical Product	Companies in this industry manufacture electrical equipment, appliances, and electrical components.	Major companies include Energizer Holdings, GE, General Cable, Hubbell, Rockwell Automation, and Whirlpool (all based in US), as well as Legrand (France), LG Electronics (South Korea), Mitsubishi Electric (Japan), Philips Lighting (the Netherlands), Prysmian (Italy), and Siemens (Germany).	China, France, Germany, Japan, South Korea, and the US	Companies in this industry manufacture large appliances, such as stoves, ovens, refrigerators, and washers and dryers, as well as small appliances, including vacuum cleaners, fans, humidifiers and dehumidifiers, and toaster ovens. The global market for electric household appliances is projected to reach 1.5 billion units by 2020, driven by innovations in technology, replacement demand, and a growing middle-class in emerging markets, such as China, India, and Turkey, according to Global Industry Analysts. ¹⁶
				Electrical product production and demand have traditionally come from established markets in North America and Western Europe, but industrialization and urbanization in emerging markets are creating new electrical product market opportunities, as well as competitive pressures. Due to product diversity, demand is driven by a number of factors, including consumer

Table 4.1: Comparative Analysis between Electrical Manufacturing Industry Sub-Sectors

¹⁶ Global Industry Analysts Research Report, 2018. https://www.marketresearch.com/Global-Industry-Analysts-v1039/

					income, construction spending, and industrial production
2.	Energy Storage (i.e. Battery)	Companies in this industry manufacture primary (disposable) batteries and storage (rechargeable) batteries for consumer, automotive, and industrial use.	Major US companies include East Penn Manufacturing, Energizer, EnerSys, Exide Technologies, Duracell, and Spectrum Brands (Rayovac); leading companies based outside the US include Taiwan's Cheng Uei Precision Industry (known as Foxlink), GP Batteries (Singapore), GS Yuasa (Japan), Johnson Controls (Ireland), and SAFT	Japan, China, and South Korea, US.	industrial production. The global battery market generates about \$85 billion in annual revenue, according to Freedonia Group. Revenue is expected to reach \$120 billion in 2019. ¹⁷ Demand depends primarily on the level of activity in the automotive and electronic sectors of the economy. Personal income drives new battery purchases in consumer goods, and consumer usage levels drive demand for replacement batteries.
3.	Energy Converter Equipment	Companies in this industry operate solar electric power generation facilities.	(France Major companies include diversified electric utilities and independent producers Berkshire Hathaway Energy, NextEra Energy, Pacific Gas and Electric, Southern California Edison, SunEdison, and TerraForm Power (all based in the US); as well as CECEP	Asia has surpassed Europe as the most advanced market for solar energy generation. China leads the world in installed solar energy capacity, followed by Japan, Germany, the US, and Italy. China also dominates manufacturing of photovoltaic (PV) cells, the	As with other power sources, demand for solar power is driven by residential, commercial, and industrial electricity demand, which increases with population and economic growth. Additionally, growing concern over environmental and geopolitical issues surrounding fossil fuels has boosted interest in renewable energy sources such as solar. The profitability of individual companies is determined by government regulations

¹⁷ Source from: https://www.freedoniagroup.com

		(China), Enerparc (Germany), Lightsource Renewable Energy (UK), and Panda Green Energy (Hong Kong).	leading technology used to produce solar power, accounting for about two- thirds of global production.	and incentives, as well as technological factors.
4. Lighting Equipment	Companies in this industry manufacture electric light bulbs and tubes as well as lighting fixtures, lamp shades, and other components and parts.	Major companies include Acuity Brands and Hubbell (both based in the US), as well as OSRAM (Germany), Philips Lighting (the Netherlands), TCP International (Switzerland), and Zumtobel (Austria).	North America and Europe collectively account for about half of the global lighting fixtures market. High growth is expected to come from the Asia/Pacific region; moderate growth is forecast for Africa and the Middle East.	Demand depends primarily on residential, industrial, and commercial construction activity. Profitability depends on efficient operations. Large companies have advantages in purchasing power, manufacturing volume, and distribution efficiencies. Small companies compete by offering specialized products and superior customer service in regional markets. Global demand for lighting fixtures is forecast to grow at a compound annual rate of about 14% through 2025, according to a 2017. ¹⁸
5. Electrical Cables	Companies in this industry make current-	Major companies include US-based Hubbell, Leviton	Top countries for the manufacture of current-	The global current-carrying electrical wiring device manufacturing industry is

¹⁸Report from Persistence Market Research. https://www.persistencemarketresearch.com/

	carrying electrical wiring devices, including bus bars, switches, connectors, and electrical receptacles (outlets) and plugs.	Manufacturing, and GE, as well as ABB (Switzerland), Legrand and Schneider (both based in France), and SMK Corporation (Japan).	carrying electrical wiring devices include China, France, Germany, Japan, and the US.	expected to generate about \$45 billion in revenue by 2020, according to Global Industry Analysts.
6. Electrical Energy Equipment	This type of equipment refers to components part of the electrical distribution system such as; Electric switchboards, Distribution boards, Circuit breakers and disconnects, Electricity meter and Transformers, electric motors, power generators, and motor generator sets	Major US companies include AMETEK, Baldor Electric (part of Switzerland-based ABB), Franklin Electric, and Regal Beloit, as well as divisions of Emerson Electric and GE; major companies based outside the US include Nidec (Japan), Panasonic (Japan), and Siemens (Germany).	Leading countries in the production of motors and generators include China, Germany, Japan, and the US. Countries that have attracted investments in motor and generator factories in recent years, in large part because of favourable cost structures, include Brazil, China, the Czech Republic, India, Mexico, and Thailand.	Industrial and manufacturing companies drive demand. The profitability of individual companies depends on efficient production. Small companies can compete by specializing. While larger companies, like GE, produce mainly a standard line of products, smaller companies are more likely to adapt products for customers' special needs.

4.3 Occupational Structure (OS)

The OS depicts the MSIC details relevant to the aforesaid industry in a matrix that relates these MSIC details to the actual sub-sectors, job areas, levels of competency and job titles in the industry. The various job areas of the industry are arranged based on the common competencies. Occupational and functional areas which require similar competencies regardless of industries, e.g. human resources, accounts & finance and information technology are not included in the OS. Only jobs and functional areas which are specific and unique to the Electrical Equipment Manufacturing Industry are included in the OS. Therefore, the OS should not be confused with an organisational chart. Kindly refer the OS in Table 4.2 and 4.3 for details.

Each sub-sector is further divided into three common job areas which are below:

4.3.1 Design

This job area involves the job scope of personnel/workers who are responsible for the design and testing of the respective electrical equipment. The entry level is as an Assistant Technical Executive at level 3, then as a Technical Executive at level 4, then at Level 5 as an Assistant Design Engineer. At level 6 these personnel will be deemed competent as Design Engineers who will lead the design process.

4.3.2 Production

The Production job area involves the workers who are directly responsible for the manufacturing of the products on the production floor. The entry level is at level 1 as a Production Operator, due to their nature of works that are routine and predictable. Together with Senior Production Operator Level 2 and Production Supervisor L3, they are involved directly on the production floor. At level 4, the Production Executive and level 5, the Assistant Production Engineer will be more concerned on the ensuring that production output is according to target and production equipment are operating smoothly with minimal downtime and final product rejection. The Production Engineer at level 6 will be more concerned with production planning and optimisation of production equipment and processes.

4.3.3 Quality Assurance

Personnel under the Quality Assurance job area are responsible for the testing of manufactured products to confirm if the products are according to the standard specifications set by the company. Any rejected products will be supported by the reasons why they are rejected and recommendations on solving the production issue. The entry level is at level 4 as a Quality Inspector, where at level 5 they will may progress as an Assistant Quality Engineer who have competencies to assist the work of the Quality Engineer in testing and audit processes, plus the preparation of related reports and documentation.

In terms of competency levels, for all three of the job areas, there will be a specialist at level 7 who will be an expert in the sub-sector and possess a high level of competency in terms of skills and knowledge in the aforesaid sub-sector. At level 8, the Principal Electrical Energy Specialist will have the highest level of competency and will have the capability to innovate new designs and solve problems plus consultation regarding all the different types of electrical product manufacturing areas.

Table 4.2: Occupational Structure for Sections C, Division 27, Group 271 & 272

MSIC SECTION	C MANUFACTURING									
MSIC DIVISION	27 - MANUFACTURE OF ELECTRICAL EQUIPMENT									
MSIC GROUP (Sub Sector)	271 - Manufao Transformers a	cture of Electric Motors nd Electricity Distributi Apparatus	, Generators, on and Control	272 - Manufacture Of Batteries And Accumulators						
Area	Energy Converter Design	Energy Converter Production	Energy Converter Quality Assurance	Energy Storage Devices Design	Energy Storage Devices Production	Energy Storage Devices Quality Assurance				
LEVEL 8	Principal Electrical Energy Specialist									
LEVEL 7	E	nergy Converter Specialis	st	Energy Storage Specialist						
LEVEL 6	Energy Converter Design Engineer*	Energy Converter Production Engineer**	Energy Converter Quality Engineer	Energy Storage Design Engineer*	Energy Storage Production Engineer**	Energy Storage Quality Engineer				
LEVEL 5	Assistant Energy Converter Design Engineer*	Assistant Energy Converter Production Engineer**	Assistant Energy Converter Quality Engineer	Assistant Energy Storage Design Engineer	Assistant Energy Storage Production Engineer**	Assistant Energy Storage Quality Engineer				
LEVEL 4	Energy Converter Technical Executive*	Energy Converter Production Executive**	Energy Converter Quality Inspector	Energy Storage Technical Executive	Energy Storage Production Executive**	Energy Storage Quality Inspector				
LEVEL 3	Assistant Energy Converter Technical Executive*	Energy Converter Production Supervisor**	No Level	Assistant Energy Storage Technical Executive	Energy Storage Production Supervisor**	No Level				
LEVEL 2	No Level	Senior Energy Converter Production Operator**	No Level	No Level	Senior Energy Storage Production Operator**	No Level				
LEVEL 1	No Level	Energy Converter Production Operator**	No Level	No Level	Energy Storage Production Operator**	No Level				

Note: *Critical Job Titles

**Jobs relevant to Industry 4.0

Table 4.3: Occupational Structure for Sections C, Division 27, Group 273 & 279

MSIC SECTION	C MANUFACTURING									
MSIC DIVISION	27 - MANUFACTURE OF ELECTRICAL EQUIPMENT									
MSIC GROUP (Sub Sector)	273 - Manufa	cture of Wiring And Wir	ring Devices	279 - Manufacture of Other Electrical Equipment						
Area	Electrical Cables Design	Electrical Cables Production	Electrical Cables Quality Assurance	Electrical Energy Equipment Design	Electrical Energy Equipment Production	Electrical Energy Equipment Quality Assurance				
LEVEL 8	Principal Electrical Energy Specialist									
LEVEL 7	E	lectrical Cables Specialis	t	Electrical Equipment Specialist						
LEVEL 6	Electrical Cables Design Engineer*	Electrical Cables Production Engineer**	Electrical Cables Quality Engineer	Electrical Equipment Design Engineer	Electrical Equipment Production Engineer**	Electrical Equipment Quality Engineer				
LEVEL 5	Assistant Electrical Cables Design Engineer	Assistant Electrical Cables Production Engineer**	Assistant Electrical Cables Quality Engineer	Assistant Electrical Equipment Design Engineer	Assistant Electrical Equipment Production Engineer**	Assistant Electrical Equipment Quality Engineer				
LEVEL 4	Electrical Cables Technical Executive	Electrical Cables Production Executive**	Electrical Cables Quality Inspector	Electrical Equipment Technical Executive	Electrical Equipment Production Executive**	Electrical Equipment Quality Inspector				
LEVEL 3	Assistant Electrical Cables Technical Executive	Electrical Cables Production Supervisor**	No Level	Assistant Electrical Equipment Technical Executive	Electrical Equipment Production Supervisor**	No Level				
LEVEL 2	No Level	Senior Electrical Cables Production Operator**	No Level	No Level	Senior Electrical Equipment Production Operator**	No Level				
LEVEL 1	No Level	Electrical Cables Production Operator**	No Level	No Level	Electrical Equipment Production Operator**	No Level				

Note: *Critical Job Titles

**Jobs relevant to Industry 4.0

Table 4.4: Occupational Structure for Sections C, Division 27, Group 274 & 275

MSIC SECTION	C – MANUFACTURING								
MSIC DIVISION	27 - MANUFACTURE OF ELECTRICAL EQUIPMENT								
MSIC Group (Sub Sector)	274 - Man	ufacture of Electric Lighting	g Equipment	275 - Manufacture of Domestic Appliances					
Area	Lighting Equipment Design	Lighting Equipment Production	Lighting Equipment Quality Assurance	Consumer Product Design	Consumer Product Production	Consumer Product Quality Assurance			
LEVEL 8	Principal Electrical Equipment Specialist								
LEVEL 7	Lighting Equipment Specialist			Consumer Product Specialist					
LEVEL 6	Lighting Equipment Lighting Equipment Design Engineer Production Engineer **		Lighting Equipment Quality Engineer	Consumer Product Design Engineer	Consumer Product Production Engineer **	Consumer Product Quality Engineer			
LEVEL 5	Assistant Lighting Equipment Design Engineer	Assistant Lighting Equipment Production Engineer **	Assistant Lighting Equipment Quality Engineer	Assistant Consumer Product Design Engineer	Assistant Consumer Product Production Engineer **	Assistant Consumer Product Quality Engineer			
LEVEL 4	Lighting Equipment Technical Executive	Lighting Equipment Production Executive **	Lighting Equipment Quality Inspector	Consumer Product Technical Executive	Consumer Product Production Executive **	Consumer Product Quality Inspector			
LEVEL 3	Assistant Lighting Equipment Technical Executive	Lighting Equipment Production Supervisor **	No Level	Assistant Consumer Product Technical Executive	Consumer Product Production Supervisor **	No Level			
LEVEL 2	No Level	Senior Lighting Equipment Production Operator **	No Level	No Level	Senior Consumer Product Production Operator **	No Level			
LEVEL 1	No Level	Lighting Equipment Production Operator **	No Level	No Level	Consumer Product Production Operator **	No Level			

Note: *Critical Job Titles

**Jobs relevant to Industry 4.0

Based on the figures shown in Table 4.4: Summary of Job Titles the total job titles for this industry is 85 job titles, with only 6 job titles at level 1 and another 6 job titles at level 2. The reason being is that most factories need workers skilled at operational where they still do routine and predictable jobs, but their job scope require them to have a certain level of decision making and understanding of the product and production process so that they can escalate any issues to superior. This is in line with employer requirements for staff even at operation level to have problem solving and decision making capabilities within their position's allowed autonomy and capacity.

	Area		Level							Number Of		
No			1	2	3	4	5	6	7	8	Job Title Identifie	es ed
Energy	Energy	Energy Converter Design	NIL	NIL	1	1	1	1			4	
1	Conventer	Energy Converter Production	1	1	1	1	1	1	1		7	
		Energy Converter Quality Assurance	NIL	NIL	NIL	1	1	1			3	
	Energy Storage	Energy Storage Devices Design	NIL	NIL	1	1	1	1			4	-
2	Devices	Energy Storage Devices Production	1	1	1	1	1	1	1		7	
	Energy Storage Devices Quality Assurance	NIL	NIL	NIL	1	1	1			3		
	Electrical	Electrical Cables Design	NIL	NIL	1	1	1	1			4]
Cables 3	Electrical Cables Production	1	1	1	1	1	1	1		7		
	Electrical Cables Quality Assurance	NIL	NIL	NIL	1	1	1		1	3	1	
	Electrical	Electrical Energy Design	NIL	NIL	1	1	1	1			4	
Energy Equipment	Electrical Energy Production	1	1	1	1	1	1	1		7		
	Electrical Energy Quality Assurance	NIL	NIL	NIL	1	1	1			3		
5 Lighting Equipment	Lighting Equipment Design	NIL	NIL	1	1	1	1			4		
	Lighting Equipment	Lighting Equipment Production	1	1	1	1	1	1	1		7	
		Lighting Equipment Quality Assurance	NIL	NIL	NIL	1	1	1			3	
6 Consumer Product		Consumer Product Design	NIL	NIL	1	1	1	1			4	
	Consumer Product	Consumer Product Production	1	1	1	1	1	1	1		7	
		Consumer Product Quality Assurance	NIL	NIL	NIL	1	1	1			3	
TOTAL NO. OF JOB TITLES IDENTIFIED		6	6	12	18	18	18	6	1	85		

Table 4.5: Summary of Job Titles

Note: NIL = No Level

The majority of job titles are at level 4, level 5 and level 6, which comprise mostly of technical executives, assistant engineers and engineers. This may be because of the current demand of workers who are capable of planning, analysis and design, especially with the advent of Industry 4.0 which requires workers to shift their skill sets to be more creative at problem solving and optimising process. Currently, there is one job title at level 8 for the whole industry, which reflects the brain drain of innovative positions for the industry compared to manufacturing industries in advanced countries.
4.4 Job Responsibilities versus NOSS Level (Job Area Description)

MSIC Division: 27 - Manufacture of Electrical Equipment

MSIC Group: 271 - Manufacture of Electric Motors, Generators, Transformers and Electricity Distribution and Control Apparatus

Table 4.6: Job Responsibilities versus NOSS Level (Job Area Description – Energy Converter)

AREA	ENERGY CONVERTER DESIGN	ENERGY CONVERTER PRODUCTION	ENERGY CONVERTER QUALITY ASSURANCE
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	Not Available	Not Available	Not Available
Level 5	 Assistant Energy Converter Design Engineer Assist the Engineer on test procedures and test circuitry Conduct product evaluation Ensure the design complies with all standards Ensure that the design follows standards required standard and has a clear understanding of the approving bodies liaises with approving bodies for queries or defects Ensure that the design standards comply with the IEE regulations and the design standards of countries that they will export to as advised by the Engineer. Prepare product specification for every product during test. Prepare test report and submit to Design Engineer. Counter check technical drawings for accuracy. 	 Assistant Energy Converter Production Engineer Coordinate with the raw material supplies store Ensure that raw materials are sufficient for weekly / monthly production Coordinate the daily/ weekly / monthly production targets with production executive, Assist the engineer in management of all supervisors and production operators Coordinate with the maintenance department that all production machines are operating at optimum levels Enforce safety regulations in the production line. 	 Assistant Energy Converter Quality Engineer Assist Energy Converter Quality Engineer by checking the work done by the quality inspector Liaise with all departments on the quality standards that have been set by the company Verify the finished products on quality and defects Reports manufacturing physical defects. Provide feedback to the production engineer Recommend changes and upgrades Operate testing equipment Analyse test reports and recommend changes that affect quality

AREA	ENERGY CONVERTER DESIGN	ENERGY CONVERTER PRODUCTION	ENERGY CONVERTER QUALITY ASSURANCE
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
	 Troubleshoot circuitry and conduct simple test to identify functionality of product. Check if all recording procedures have been adhered to in case of audit. Ensure that the products comply with the safety standards. Ensure that test equipment is working well and calibrated. Analyse results and cause of any deviation. Able to conduct self-evaluation on his staff and ensure that all procedures are executed. 		
Level 4	Energy Converter Technical Executive	Energy Converter Production Executive	Energy Converter Quality Inspector
	 Ensure the design engineers have enough resources for the product design stage 	sufficient for weekly / monthly production	 Lest and check the linished products randomly to detect manufacturing physical defects
	2. Prepare all components, documents and	2. Coordinate the daily/ weekly / monthly	2. Conducts functional test
	standards required by the Design Engineer.	production targets	3. Gives feedback to the production line
	3. Prepare method statement on how to Set up	3. Manage all supervisors and production	4. Gives feedback on the rejects and the reasons
	4. Interpret method statement for test	4. Ensure all production machines are operating	5. Conducts insulation test, impedance test.
	procedures	at optimum levels and ensures safety	conductivity test
	Check and verify that the product and device conforms to standard	regulations are observed in the production line.	 Recommends adjustments to the production supervisor
	6. Check and verify the recording of test results	5. Coordinate with the senior material handler or	
	 Verify that the product complies to safety standards 	store for supply of raw materials	
	8. Check if all recording procedures have been	supervisors and shift supervisors	
	adhered to in case of audit	7. Check the records his operators daily	
	 Set up and utilise test equipment and calibration 	production and submit report to his production	
	10. Check results and recognize if there is a	8. Monitor records of raw materials consumption	
	deviation and if so the cause of that deviation	9. Liaise with packaging department and storage	
		prior to shipping	
		IU. Recognize and identify delays, downtime and	
		11. Recover the time lost and reorganize to still	
		achieve the set targets	

AREA	ENERGY CONVERTER DESIGN	ENERGY CONVERTER PRODUCTION	ENERGY CONVERTER QUALITY ASSURANCE
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
Level 3	Assistant Energy Converter Technical	 Monitor the setting up and using production equipment such as dimension, pressure setting and temperature setting. Liaise with the Q.C. and receive feedback Select equipment to be used in production Energy Storage Production Supervisor Supervise all the production operators and 	No Level
	 Assist the Energy Converter Design Engineer and Technical Executive in the design and during manufacturing of energy converter products for household and industrial applications. Ensure that the product complies to the safety standards required Record test results, prepare and submit to Superior Carry out and maintain proper recording Interpret technical drawings Set up and using test equipment 	 Supervise all the production operators and maintain record of attendance Ensure that raw materials are sufficient for production Ensure production machines are operating smoothly Ensure machine operators observe safety regulations. Identify any minor malfunctions of the production equipment. Coordinate with the material handler or store for supply of raw materials. Maintains records of raw materials. Conduct daily morning meeting with all production operators. Records operators' daily production. Assist in the minor troubleshooting liaison with maintenance crew when needed. Carry out minor preventive maintenance on the production equipment. Send products for random testing at the Q.C. and receive feedback. 	No Lovel
Level 2	No Level	Energy Converter Production Operator	No Level

AREA	ENERGY CONVERTER DESIGN		ENERGY CONVERTER QUALITY ASSURANCE
	Responsibilities May Include	 Responsibilities May Include Ensure that the production machine can operate efficiently to meet production capacity. Checks machine on a daily basis for defects or problems Checks that there is sufficient raw material to carry out production. Ensure that there is minimum rejects during working time Follows all the safety rules and regulations. Operate machines as instructed by the supervisor. Troubleshoot and maintain the equipment in the best manner possible. Identify any malfunctions of the production equipment. Carry out minor preventive maintenance on the production equipment. Identify and rectify minor malfunctions of the production equipment. 	Responsibilities May Include
Level 1	No Level	No Level	No Level

MSIC Division: 27 - Manufacture of Electrical Equipment MSIC Group: 272 - Manufacture of Batteries and Accumulators

	Bosponsibilities May Include	Bosponsibilities May Include	Bosponsibilities May Include
	Responsibilities may include		Responsibilities may include
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	Not Available	Not Available	Not Available
Level 5	Assistant Energy Storage Design Engineer	Assistant Energy Storage Production Engineer	Assistant Energy Storage Quality Engineer
	1. Assist the Engineer on test procedures and	1. Prepare and maintain detailed layouts of	1. Assist Energy Storage Quality Engineer by
	test circuitry	processes and related equipment.	checking the work done by the quality
	2. Conduct product evaluation	2. Coordinate the manufacturing launch of	inspector
	3. Ensure the design complies with all standards	new/revised products.	2. Liaise with all departments on the quality
	4. Ensure that the design follows standards	3. Design, develop and test and / or source and	standards that have been set by the company
	required standard and has a clear	cost-justify various tools, machinery, and	3. Verify the finished products on quality and
	understanding of the approving bodies	equipment for recommended manufacturing	defects
	5. liaises with approving bodies for gueries or	methods.	4. Reports manufacturing physical defects.
	defects	4. Determine product specifications and arrange	5. Provide feedback to the production engineer
	6. Ensure that the design standards comply with	for purchase of machinery and equipment	6. Recommend changes and upgrades
	the IFF regulations and the design standards	according to specifications and quality	7 Operate testing equipment
	of countries that they will export to as advised	standards	8 Analyse test reports and recommend changes
	by the Engineer	5 Perform product / process analysis for cost	that affect quality
	7 Prepare product specification for every	reduction quality improvement and improved	
	product during test	efficiency	
	8 Prepare test report and submit to Design	6 Coordinate with the raw material supplies	
	Engineer	store to ensure that raw materials are	
	9 Counter check technical drawings for	sufficient for weekly / monthly production	
		7 Coordinate the daily/weekly/monthly	
	10 Troubleshoot circuitry and conduct cimple test	production targets with production executive	
	to identify functionality of product	Assist the orgineer in management of all	
	11 Check if all recording procedures have been	o. Assist the engineer in management of all	
	adhered to in according procedures have been	supervisors and production operators	
	aunered to in case of audit.		

Table 4.7: Job Responsibilities versus NOSS Level (Job Area Description – Energy Storage)

AREA	ENERGY STORAGE DESIGN	ENERGY STORAGE PRODUCTION	ENERGY STORAGE QUALITY ASSURANCE
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
	 Ensure that the products comply with the safety standards. Ensure that test equipment is working well and calibrated. Analyse results and cause of any deviation. Conduct self-evaluation on staff and ensure that all procedures are executed. 	 Coordinate with the maintenance department that all production machines are operating at optimum levels Enforce safety regulations in the production line. 	
Level 4	 Energy Storage Technical Executive Ensure the design engineers have enough resources for the product design stage Prepare all components, documents and standards required by the Design Engineer. Prepare method statement on how to Set up and Conduct Mock up test Interpret method statement for test procedures Check and verify that the product and device conforms to standard Check and verify the recording of test results Verify that the product complies to safety standards Check if all recording procedures have been adhered to in case of audit Set up and utilise test equipment and calibration Check results and recognize if there is a deviation and if so the cause of that deviation 	 Energy Storage Production Executive Conduct inspection on battery casing and terminal post by batch Record overall battery production by batch Record battery production by model Record battery that is insufficiently charged according to MS45:2009 (SIRIM) Coordinate the daily/ weekly / monthly production targets Manage all supervisors and production operators Ensure all production machines are operating at optimum levels and ensures safety regulations are observed in the production line. Conduct daily meeting with all production supervisors and shift supervisors Check the records his operators daily production and submit report to his production engineer Liaise with packaging department and storage prior to shipping Recognize and identify delays, downtime and how to rectify Liaise with the Q.C. and receive feedback 	 Energy Storage Quality Inspector Test and check the finished products randomly to detect manufacturing physical defects Conducts functional test Gives feedback to the production line Gives feedback on the rejects and the reasons why Conducts insulation test, impedance test, conductivity test Recommends adjustments to the production supervisor

AREA	ENERGY STORAGE DESIGN	ENERGY STORAGE PRODUCTION	ENERGY STORAGE QUALITY ASSURANCE
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
Level 3	 Assistant Energy Storage Technical Executive Assist the Energy Storage Design Engineer and Technical Executive in the design and during manufacturing of energy converter products for household and industrial applications. Ensure that the product complies to the safety standards required Record test results, prepare and submit to Superior Carry out and maintain proper recording Interpret technical drawings Set up and using test equipment 	 Energy Storage Production Supervisor Supervise all the production operators and maintain record of attendance Ensure that raw materials are sufficient for production Ensure production machines are operating smoothly Ensure machine operators observe safety regulations. Identify any minor malfunctions of the production equipment. Coordinate with the material handler or store for supply of raw materials. Conduct daily morning meeting with all production operators Records operators' daily production Assist in the minor troubleshooting liaison with maintenance crew when needed Carry out minor preventive maintenance on the production equipment Send products for random testing at the Q.C. and receive feedback 	No Level
Level 2	No Level	 Energy Storage Production Operator Arrange work load and scheduling to meet the production capacity. Ensure that the production machine can operate efficiently to meet production capacity. Checks machine on a daily basis for defects or problems Checks that there is sufficient raw material to carry out production. Ensure that there is minimum rejects during working time Follows all the safety rules and regulations. 	No Level

AREA	ENERGY STORAGE DESIGN Responsibilities May Include	ENERGY STORAGE PRODUCTION Responsibilities May Include	ENERGY STORAGE QUALITY ASSURANCE Responsibilities May Include
		 Operate machines as instructed by the supervisor. Troubleshoot and maintain the equipment in the best manner possible. Identify any malfunctions of the production equipment. Carry out minor preventive maintenance on the production equipment. Identify and rectify minor malfunctions of the production equipment. 	
Level 1	No Level	No Level	No Level

Division:27 - Manufacture of Electrical EquipmentMSIC Group:273 - Manufacture of Wiring and Wiring Devices

Table 4.8: Job Responsibilities versus NOSS Level (Job Area Description – Electrical Cable)

AREA	ELECTRICAL CABLES DESIGN	ELECTRICAL CABLES PRODUCTION	ELECTRICAL CABLES QUALITY ASSURANCE
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	Not Available	Not Available	Not Available
Level 5	Assistant Electrical Cables Design Engineer	Assistant Electrical Cables Production	Assistant Electrical Cables Quality Engineer
	1. Assist Engineer on test procedures and test	Engineer	1. Assist Electrical Cables Quality Engineer by
	circuitry	1. Prepare and maintain detailed layouts of	checking the work done by the quality
	2. Conduct product evaluation	processes and related equipment.	inspector
	3. Ensure the design complies with all standards	2. Coordinate the manufacturing launch of	2. Liaise with all departments on the quality
	4. Ensure that the design follows standards	new/revised products.	standards that have been set by the company
	required standard and has a clear	3. Design, develop and test and / or source and	3. Verify the finished products on quality and
	understanding of the approving bodies	cost-justify various tools, machinery, and	defects
	5. liaises with approving bodies for queries or	equipment for recommended manufacturing	4. Reports manufacturing physical defects.
	defects	methods.	5. Provide feedback to the production engineer
	6. Ensure that the design standards comply with	4. Determine product specifications and arrange	6. Recommend changes and upgrades
	the IEE regulations and the design standards	for purchase of machinery and equipment	7. Operate testing equipment
	of countries that they will export to as advised	according to specifications and quality	8. Analyse test reports and recommend changes
	by the Engineer.	Standards.	that affect quality
	7. Prepare product specification for every	5. Periorini produci / process analysis for cost	
	Product during test. Proport test report and submit to Design	officionary	
	Engineer	6 Coordinate with the raw material supplies	
	9 Counter check technical drawings for	store to ensure that raw materials are	
	accuracy	sufficient for weekly / monthly production	
	10 Troubleshoot circuitry and conduct simple test	7 Coordinate the daily/ weekly / monthly	
	to identify functionality of product.	production targets with production executive	
	11. Check if all recording procedures have been	8. Assist the engineer in management of all	
	adhered to in case of audit.	supervisors and production operators	

AREA	ELECTRICAL CABLES DESIGN	ELECTRICAL CABLES PRODUCTION	ELECTRICAL CABLES QUALITY ASSURANCE
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
	 Ensure that the products comply with the safety standards. Ensure that test equipment is working well and calibrated. Analyse results and cause of any deviation. Able to conduct self-evaluation on his staff and ensure that all procedures are executed. 	 9. Coordinate with the maintenance department that all production machines are operating at optimum levels 10. Enforce safety regulations in the production line. 	
Level 4	 Electrical Cables Technical Executive Ensure Design Engineers have enough resources for the product design stage Prepare all components, documents and standards required by the Design Engineer. Prepare method statement on how to Set up and Conduct Mock up test Interpret method statement for test procedures Check and verify that the product and device conforms to standard Check and verify the recording of test results Verify that the product complies to safety standards Check if all recording procedures have been adhered to in case of audit Set up and utilise test equipment and calibration Check results and recognize if there is a deviation and if so the cause of that deviation 	 Electrical Cables Production Executive Ensure and forecast that raw materials are sufficient for weekly / monthly production Coordinate the daily/ weekly / monthly production targets Manage all supervisors and production operators Ensure all production machines are operating at optimum levels and ensure safety regulations are observed in the production line. Coordinate with the senior material handler or store for supply of raw materials Conduct daily meeting with all production supervisors and shift supervisors Check the records his operators daily production and submit report to his production engineer Monitor records of raw materials consumption Liaise with packaging department and storage prior to shipping Recognize and identify delays, downtime and how to rectify Recover the time lost and reorganize to still achieve the set targets Monitor the setting up and using production equipment such as dimension, pressure setting and temperature setting. 	 Electrical Cables Quality Inspector 1. Test and check the finished products randomly to detect manufacturing physical defects 2. Conducts functional test 3. Gives feedback to the production line 4. Gives feedback on the rejects and the reasons why 5. Conducts insulation test, impedance test, conductivity test 6. Recommends adjustments to the production supervisor

AREA	ELECTRICAL CABLES DESIGN	ELECTRICAL CABLES PRODUCTION	ELECTRICAL CABLES QUALITY ASSURANCE
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
		 Liaise with the Q.C. and receive feedback Select equipment to be used in production 	
Level 3	 <u>Assistant Electrical Cables Technical</u> <u>Executive</u> 1. Assist the Electrical Cable Design Engineer and Technical Executive in the design and during manufacturing of energy converter products for household and industrial applications. 2. Ensure that the product complies to the safety standards required 3. Record test results, prepare and submit to Superior 4. Carry out and maintain proper recording 5. Interpret technical drawings 6. Set up and using test equipment 	 Electrical Cables Production Supervisor Supervise all the production operators and maintain record of attendance Ensure that raw materials are sufficient for production Ensure production machines are operating smoothly Ensure machine operators observe safety regulations. Identify any minor malfunctions of the production equipment. Coordinate with the material handler or store for supply of raw materials. Conduct daily morning meeting with all production operators. Records operators' daily production. Assist in the minor troubleshooting liaison with maintenance crew when needed. Carry out minor preventive maintenance on the production equipment. 	No Level
Level 2	No Level	 Electrical Cables Production Operator Ensure that the production machine can operate efficiently to meet production capacity. Checks machine on a daily basis for defects or problems Checks that there is sufficient raw material to carry out production. Ensure that there is minimum rejects during working time 	No Level

AREA	ELECTRICAL CABLES DESIGN Responsibilities May Include	ELECTRICAL CABLES PRODUCTION Responsibilities May Include	ELECTRICAL CABLES QUALITY ASSURANCE Responsibilities May Include
		 Follows all the safety rules and regulations. Operate machines as instructed by the supervisor. Troubleshoot and maintain the equipment in the best manner possible. Identify any malfunctions of the production equipment. Carry out minor preventive maintenance on the production equipment. Identify and rectify minor malfunctions of the production equipment. 	
Level 1	No Level	No Level	No Level

MSIC Division: 27 - Manufacture of Electrical Equipment MSIC Group: 279 - Manufacture of Other Electrical Equipment

Table 4.9: Job Responsibilities versus NOSS Level (Job Area Description – Electrical Energy Equipment)

AREA	ELECTRICAL ENERGY EQUIPMENT DESIGN	ELECTRICAL ENERGY EQUIPMENT	ELECTRICAL ENERGY EQUIPMENT QUALITY
		Responsibilities May Include	Responsibilities May Include
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	Not Available	Not Available	Not Available
Level 5	Assistant Electrical Equipment Design	Assistant Electrical Equipment Production	Assistant Electrical Equipment Quality
	Engineer	Engineer	Engineer
	1. Assist Engineer on test procedures and test	1. Prepare and maintain detailed layouts of	1. Assist Electrical Equipment Quality Engineer
	2 Conduct product evaluation	2 Coordinate the manufacturing launch of	inspector
	3. Ensure the design complies with all standards	new/revised products.	2. Liaise with all departments on the quality
	4. Ensure that the design follows standards required standard and has a clear	 Design, develop and test and / or source and cost-justify various tools, machinery, and 	standards that have been set by the company Verify the finished products on quality and
	understanding of the approving bodies	equipment for recommended manufacturing	defects
	5. liaises with approving bodies for queries or	methods.	4. Reports manufacturing physical defects.
	defects	4. Determine product specifications and arrange	5. Provide feedback to the production engineer
	6. Ensure that the design standards comply with	for purchase of machinery and equipment	6. Recommend changes and upgrades
	the IEE regulations and the design standards	according to specifications and quality	7. Operate testing equipment
	by the Engineer	5 Perform product / process analysis for cost	that affect quality
	 Prepare product specification for every product 	reduction, quality improvement and improved	
	during test.	efficiency.	
	S. Prepare test report and submit to Design	6. Coordinate with the raw materials are	
	9. Counter check technical drawings for	sufficient for weekly / monthly production	
	accuracy.	7. Coordinate the daily/ weekly / monthly	
	10. Troubleshoot circuitry and conduct simple test	production targets with production executive	
	to identify functionality of product.		

AREA ELECTRICAL ENERGY EQUIPMENT DES	IGN ELECTRICAL ENERGY EQUIPMENT	ELECTRICAL ENERGY EQUIPMENT QUALITY
Responsibilities May Include	PRODUCTION	ASSURANCE
	Responsibilities May Include	Responsibilities May Include
 Check if all recording procedures hav adhered to in case of audit. Ensure that the products comply w safety standards. Ensure that test equipment is working v calibrated. Analyse results and cause of any devia Able to conduct self-evaluation on st ensure that all procedures are executed 	 a been a Assist the engineer in management of all supervisors and production operators b Coordinate with the maintenance department that all production machines are operating at optimum levels c Enforce safety regulations in the production line. 	
 Level 4 Electrical Equipment Technical Executiv 1. Ensure design engineers have enough resources for the product design stage 2. Prepare all components, documents an standards required by the Design Engir 3. Prepare method statement on how to S and Conduct Mock up test 4. Interpret method statement for test procedures 5. Check and verify that the product and c conforms to standard 6. Check and verify the recording of test r 7. Verify that the product complies to safe standards 8. Check if all recording procedures have adhered to in case of audit 9. Set up and utilise test equipment and calibration 10. Check results and recognize if there is deviation and if so the cause of that devi 	EElectrical Equipment Production Executive1.Ensure and forecast that raw materials are sufficient for weekly / monthly production2.Coordinate the daily/ weekly / monthly production targetseer.3.Manage all supervisors and production operatorset up3.Manage all production machines are operating at optimum levels and ensure safety regulations are observed in the production line.evice5.Conduct daily meeting with all production supervisors and shift supervisors6.Check the records his operators daily production and submit report to his production engineer7.Monitor records of raw materials consumption 8.8.Liaise with packaging department and storage prior to shipping9.Recognize and identify delays, downtime and how to rectify10.Recover the time lost and reorganize to still achieve the set targets11.Monitor the setting up and using production equipment such as dimension, pressure	 Electrical Equipment Quality Inspector 1. Test and check the finished products randomly to detect manufacturing physical defects 2. Conducts functional test 3. Gives feedback to the production line 4. Gives feedback on the rejects and the reasons why 5. Conducts insulation test, impedance test, conductivity test 6. Recommends adjustments to the production supervisor

AREA	ELECTRICAL ENERGY EQUIPMENT DESIGN Responsibilities May Include	ELECTRICAL ENERGY EQUIPMENT PRODUCTION	ELECTRICAL ENERGY EQUIPMENT QUALITY ASSURANCE
		Responsibilities May Include 12. Liaise with the Q.C. and receive feedback 13. Select equipment to be used in production	Responsibilities May Include
Level 3	 Assistant Electrical Equipment Technical Executive Assist Electrical Equipment Design Engineer and Technical Executive in the design and during manufacturing of energy converter products for household and industrial applications. Ensure that the product complies to the safety standards required Record test results, prepare and submit to Superior Carry out and maintain proper recording Interpret technical drawings Set up and using test equipment 	 Electrical Equipment Production Supervisor Supervise all the production operators and maintain record of attendance Ensure that raw materials are sufficient for production Ensure production machines are operating smoothly Ensure machine operators observe safety regulations. Identify any minor malfunctions of the production equipment. Coordinate with the material handler or store for supply of raw materials. Maintains records of raw materials. Conduct daily morning meeting with all production operators? Records operators' daily production. Assist in the minor troubleshooting liaison with maintenance crew when needed. Carry out minor preventive maintenance on the products for random testing at the Q.C. and receive feedback. 	No Level
Level 2	No Level	 Electrical Equipment Production Operator Ensure that the production machine can operate efficiently to meet production 	No Level
		capacity.	

AREA	ELECTRICAL ENERGY EQUIPMENT DESIGN	ELECTRICAL ENERGY EQUIPMENT	ELECTRICAL ENERGY EQUIPMENT QUALITY
	Responsibilities May Include	PRODUCTION	ASSURANCE
		Responsibilities May Include	Responsibilities May Include
		 Checks machine on a daily basis for defects or problems Checks that there is sufficient raw material to carry out production. Ensure that there is minimum rejects during working time Follows all the safety rules and regulations. Operate machines as instructed by the supervisor. Troubleshoot and maintain the equipment in the best manner possible. Identify any malfunctions of the production equipment. Carry out minor preventive maintenance on the production equipment. Identify and rectify minor malfunctions of the production equipment. 	
Level 1	No Level	No Level	No Level

MSIC Division: 27 - Manufacture of Electrical Equipment MSIC Group: 274 - Manufacture of Electric Lighting Equipment

Table 4.10: Job Responsibilities versus NOSS Level (Job Area Description – Electrical Lighting)

AREA	LIGHTING EQUIPMENT DESIGN	LIGHTING EQUIPMENT PRODUCTION	LIGHTING EQUIPMENT QUALITY ASSURANCE
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	Not Available	Not Available	Not Available
Level 5	 Assistant Lighting Equipment Design Engineer Interpret the design brief of the customer Endorse Insulation test, Impedance test, conductivity test and strength tests results Ensure that test equipment is working well and calibrated. Prepares the method statement Interpret Design standards of host country and check that it complies to requirements of IEE regulations, IEC, Energy commission, SIRIM and IP Construct the method statement document for test procedures Verify submitted test procedures for the product by subordinate Check and verify that the product and device conforms to the colour frequency standards set. Certify Lumens test results Certify test results of the weathering test for outdoor lighting in compliance with IP 	 Assistant Lighting Equipment Production Engineer Conduct meetings with all production executives and shift supervisors. Check the records of his production executives daily production and submit report to his production engineer. Monitors records of raw materials consumption Ensure that there is no unnecessary wastage of raw material. Ensure that there is no unnecessary pollution Check the final product packing and send to storage and shipping department Recognize and identify delays , downtime and propose methods to recover Tweak and enhance the production to operate smoothly and produce best quality goods Absorb and assimilate information to achieve Production targets Liaise with the QC and make necessary recommendations to the Production Engineer to improve the quality and reduce defects 	 Assistant Lighting Equipment Quality Engineer Conduct functional test Assist in performing Quality audit Provide feedback to the production engineer Provide feedback and analysis on the rejects and the reasons why Recommend changes and upgrades Operate testing equipment Analyse test reports and recommend changes that affect quality Ensure that all products are produced according to specifications from the lighting equipment specialist. Liaise with the production engineer on the quality and defects Ensure that the process is following the set quality standards such as ISO & etc. Ensure that the testing equipment are calibrated periodically Maintain a recording system of approvals and rejects in a log Report any defects to immediate superior

AREA	LIGHTING EQUIPMENT DESIGN	LIGHTING EQUIPMENT PRODUCTION	LIGHTING EQUIPMENT QUALITY ASSURANCE
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
	 Certify the results of the ("Burn test) - with regards to device lifespan Certify recorded test results, prepare for submission to Design Engineer Verify if all recording procedures have been adhered to in case of audit Counter check technical drawings for accuracy Check results and recognize if there is a deviation and if so the cause of that deviation. Check and verify that the Pilot Trial test was done in accordance to international and performance standards required Conduct load test (amps) on product Verify that the product complies to the safety standards required 	 Monitors the production equipment for smooth operation Advises his production executive on the drawings and specifications after discussion with his engineer Manage conflicts between lower management when necessary 	14. Provide feedback to material handlers material depreciation
Level 4	 Lighting Equipment Technical Executive Ability to read and interpret technical drawings Prepare method statement on how to Set up and Conduct Mock up test - Interpret method statement for test procedures Conduct load test (amps) on product Check and verify that the Pilot Trial test was done in accordance to international and performance standards required Check and verify Lumens testing if it reaches the required lumens Check and verify that the product and device conforms to the colour frequency standards set Check and verify the weathering test for outdoor lighting - subjecting the device to outdoor conditions Check and verify the recording of test results outdoor conditions 	 Lighting Equipment Production Executive Interpret technical drawings and specifications Manage conflicts between lower management Coordinate with the senior material handler or store for supply of raw materials Conduct daily meeting with all production supervisors and shift supervisors Check the records his operators daily production and submit report to his production engineer Monitor records of raw materials consumption Ensure that there is no unnecessary wastage of raw materials. Ensure that there is no wastage and unnecessary pollution. Liaise with packaging department and storage prior to shipping Recognize and identify delays, downtime and how to rectify 	 Lighting Equipment Quality Inspector Obtain samples of finished products on an hourly, daily basis Obtain samples of finished products on an hourly, daily basis Liaise with the production engineer on the quality and defects Ensure that the process is following the set quality standards such as ISO etc. Ensure that the testing equipment are calibrated periodically Maintain a recording system of approvals and rejects in a log Report any defects to immediate superior – i.e. Quality Engineer Provide feedback to material handlers material depreciation Operate testing equipment Prepare testing and rejection reports

AREA	LIGHTING EQUIPMENT DESIGN	LIGHTING EQUIPMENT PRODUCTION	LIGHTING EQUIPMENT QUALITY ASSURANCE
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
	 technical executive and further submit to Design engineer 9. Verify that the product complies to safety standards required 10. Verify test results - Insulation test , Impudence test , conductivity test , strength test 11. Verify that the device to has undergone extensive "Burn test" - equipment/ device life as per pre-set conditions by his superior . 12. Verify that the product complies to the safety standards required 13. Check if all recording procedures have been adhered to in case of audit 14. Set up and utilise test equipment and calibration 15. Check results and recognize if there is a deviation and if so the cause of that deviation. 	 Recover the time lost and reorganize to still achieve the set targets Monitor the setting up and using production equipment such as dimension, pressure setting and temperature setting. Liaise with the Q.C. and receive feedback Select equipment to be used in production 	 11. Analyse test reports and recommend changes that affect quality 12. Assist in performing Quality audit 13. Issue a stop work order signed off by the Quality Engineer when necessary. 14. Check sealing and packing of finished products
Level 3	 <u>Assistant Lighting Equipment Technical</u> <u>Executive</u> 1. Conduct Insulation test, impedance test, conductivity test and strength test 2. Set up and Conduct Mock up test - conduct Lumens testing if it reaches the required lumens 3. Set up and conduct weathering test for outdoor lighting - subjecting the device to outdoor conditions 4. Subject the device to ("Burn test) - with regards to device lifespan 	 Lighting Equipment Production Supervisor Interpret technical drawings and specifications. Handle conflicts between workers. Identify any minor malfunctions of the production equipment. Set the daily production targets. Coordinate with the material handler or store for supply of raw materials. Maintains records of raw materials. Conduct daily morning meeting with all production operators. Records operators' daily production. 	No Level

AREA	LIGHTING EQUIPMENT DESIGN	LIGHTING EQUIPMENT PRODUCTION	LIGHTING EQUIPMENT QUALITY ASSURANCE
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
	 Ensure that the product complies to the safety standards required Record test results, prepare and submit to Superior Carry out and maintain proper recording Interpret technical drawings Set up and using test equipment 	 Ensure that there is no unnecessary wastage of material. Send finished goods to the packing and storage department. Assist in the minor troubleshooting liaison with maintenance crew when needed. Carry out minor preventive maintenance on the production equipment. Send his products for random testing at the Q.C. and receive feedback. 	
Level 2	No Level	 Lighting Equipment Production Operator Ensure that the production machine can operate efficiently to meet production capacity. Checks machine on a daily basis for defects or problems Checks that there is sufficient raw material to carry out production. Ensure that there is minimum rejects during working time Follows all the safety rules and regulations. Operate machines as instructed by the supervisor. Troubleshoot and maintain the equipment in the best manner possible. Identify any malfunctions of the production equipment. Identify and rectify minor malfunctions of the production equipment. 	No Level
Level 1	No Level	No Level	No Level

MSIC Division: 27 - Manufacture of Electrical Equipment MSIC GROUP: 275 - Manufacture of Domestic Appliances

Table 4.11: Job Responsibilities versus NOSS Level (Job Area Description – Consumer Product)

AREA	CONSUMER PRODUCT DESIGN	CONSUMER PRODUCT PRODUCTION	CONSUMER PRODUCT QUALITY
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	Not Available	Not Available	Not Available
Level 5	Assistant Consumer Product Design Engineer	Assistant Consumer Product Production	Assistant Quality Engineer
	1. Interpret design brief of the customer	Engineer	Conduct functional test.
	2. Ensure that test equipment is working well and	1. Improve productivity through automation of	1. Assist in performing Quality audit.
	calibrated.	select processes.	2. Provide feedback to the production engineer.
	3. Prepare method statement	2. Support product testing functions as needed.	3. Provide feedback and analysis on the rejects
	4. Ensure design standards complies to	3. Prepare and maintain detailed layouts of	and the reasons why.
	requirements of IEE regulations, IEC, Energy	processes and related equipment.	4. Recommend changes and upgrades.
	commission, SIRIM and IP.	4. Coordinate the manufacturing launch of	5. Operate testing equipment.
	5. Construct method statement document for test	new/revised products.	6. Analyse test reports and recommend changes
	procedures.	5. Design, develop and test and / or source and	that affect quality.
	6. Verify submitted test procedures for the	cost-justify various tools, machinery, and	7. Ensure that all products are produced
	product by subordinate.	equipment for recommended manufacturing	according to specifications.
	7. Certify recorded test results.	methods.	8. Liaise with the production engineer on the
	8. Verify if all recording procedures have been	6. Determine product specifications and arrange	quality and defects.
	adhered to in case of audit.	for purchase of machinery and equipment	9. Ensure that the process is following the set
	9. Counter check technical drawings for	according to specifications and quality	quality standards such as ISO & etc.
	accuracy.	standards.	10. Ensure that the testing equipment are
	10. Check results and recognize if there is a	7. Perform product / process analysis for cost	calibrated periodically.
	deviation and if so the cause of that deviation.	reduction, quality improvement and improved	11. Maintain a recording system of approvals and
		efficiency.	rejects in a log.
		8. Participate in plant wide safety initiatives.	12. Report any defects to immediate superior.

AREA	CONSUMER PRODUCT DESIGN	CONSUMER PRODUCT PRODUCTION	CONSUMER PRODUCT QUALITY ASSURANCE
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
	 Check and verify that Pilot Trial test was done in accordance to international and performance standards required. Conduct load test (amps) on product. Verify that product complies with the safety standards required. Study regulatory affairs requirement. 		13. Provide feedback to material handlers material depreciation.
Level 4	 Consumer Product Technical Executive Interpret technical drawings. Prepare method statement on how to set up and conduct mock up test. Interpret method statement for test procedures. Verify that the product complies with safety standards required. Verify that the product complies with the safety standards required. Check if all recording procedures have been adhered to in case of audit. Set up and utilise test equipment and calibration. Check results and recognize if there is a deviation and if so the cause of that deviation. 	 Consumer Product Production Executive Perform product testing functions as needed. Prepare layouts of processes and related equipment. Perform the manufacturing launch of new/revised products. Test and cost-justify various tools, machinery, and equipment for recommended manufacturing methods. Determine product specifications of machinery and equipment according to specifications and quality standards. Participate in plant wide safety initiatives. 	 Quality Inspector Obtain samples of finished products on an hourly and daily basis. Liaise with the production engineer on the quality and defects. Ensure that the process is following the set quality standards such as ISO & etc. Ensure that the testing equipment are calibrated periodically. Maintain a recording system of approvals and rejects in a log. Report any defects to immediate superior. Provide feedback to material handlers material depreciation. Operate testing equipment. Prepare testing and rejection reports. Analyse test reports and recommend changes that affect quality. Issue stop work order signed off by the Quality Engineer when necessary. Check sealing and packing of finished products.
Level 3	Assistant Consumer Product Technical	Consumer Product Production Supervisor	No Level
	Executive	1. Read and interpret technical drawings and	
	1. Conduct test to check insulation and conductivity	specifications. 2 Handle conflicts between workers	

AREA	CONSUMER PRODUCT DESIGN	CONSUMER PRODUCT PRODUCTION	CONSUMER PRODUCT QUALITY
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
	 Check if the product complies with the safety standards required. Record test results, prepare and submit to Superior. Interpret technical drawings. Set up and utilise test equipment according to procedures. 	 Identify any minor malfunctions of the production equipment. Discuss and set the daily production targets. Coordinate with the material handler or store for supply of raw materials. Maintains records of raw materials. Conduct daily morning meeting with all production operators. Records operators' daily production. Ensure that there is no unnecessary wastage of material. Send finished goods to the packing and storage department. Assist in the minor troubleshooting liaison with maintenance crew when needed. Carry out minor preventive maintenance on the production equipment. Send his products for random testing at the Q.C and receive feedback. Recover the time lost and reorganize to still achieve the set targets. 	
Level 2	No Level	 Consumer Product Production Operator Receive instructions from the Production Supervisor on the quantity of products to be produced. Arrange work load and scheduling to meet the production capacity. Ensure that the production machine can operate efficiently to meet production capacity. Checks machine on a daily basis for defects or problems. Checks that there is sufficient raw material to carry out production. 	No Level

AREA	CONSUMER PRODUCT DESIGN	CONSUMER PRODUCT PRODUCTION	CONSUMER PRODUCT QUALITY ASSURANCE
	Responsibilities May Include	Responsibilities May Include	Responsibilities May Include
		 Ensure that there is minimum rejects during working time. Follows all the safety rules and regulations. Operate the machine as instructed by the supervisor. Troubleshoot and maintain the equipment in the best manner possible. Able to identify any malfunctions of the production equipment. Carry out minor preventive maintenance on the production equipment. Able to work independently with minimum supervision. Able to identify and rectify minor malfunctions of the production equipment. 	
Level 1	No Level	No Level	No Level

4.5 Mapping of OS Job Areas versus Available NOSS

Table 4.12 below shows the mapping between the available NOSS and the job areas identified in the industry's OS.

MSIC SECTION	C MANUFACTURING					
MSIC DIVISION	27 - MANUFACTURE OF ELECTRICAL EQUIPMENT					
MSIC GROUP (Sub Sector)	271 - Manufacture of Electric Motors, Generators, Transformers and Electricity Distribution and Control Apparatus			272 - Manufacture Of Batteries And Accumulators		
Area	Energy Converter Design	Energy Converter Production	Energy Converter Quality Assurance	Energy Storage Devices Design	Energy Storage Devices Production	Energy Storage Devices Quality Assurance
LEVEL 8	Principal Electrical Energy Specialist					
LEVEL 7	Energy Converter Specialist			Energy Storage Specialist		
LEVEL 6	Energy Converter Design Engineer*	Energy Converter Production Engineer**	Energy Converter Quality Engineer	Energy Storage Design Engineer*	Energy Storage Production Engineer**	Energy Storage Quality Engineer
LEVEL 5	Assistant Energy Converter Design Engineer*	Assistant Energy Converter Production Engineer**	Assistant Energy Converter Quality Engineer	Assistant Energy Storage Design Engineer	EE-212-5:2013 Solar Panel Manufacturing Management	Assistant Energy Storage Quality Engineer
LEVEL 4	Energy Converter Technical Executive*	Energy Converter Production Executive**	Energy Converter Quality Inspector	Energy Storage Technical Executive	EE-212-4:2013 Solar Panel Manufacturing Control	Energy Storage Quality Inspector
LEVEL 3	Assistant Energy Converter Technical Executive*	Energy Converter Production Supervisor**	No Level	Assistant Energy Storage Technical Executive	EE-212-3:2013 Solar Panel Manufacturing Operation (Thin Film Module)	No Level
LEVEL 2	No Level	Senior Energy Converter Production Operator**	No Level	No Level	Senior Energy Storage Production Operator**	No Level
LEVEL 1	No Level	Energy Converter Production Operator**	No Level	No Level	Energy Storage Production Operator**	No Level

Table 4.12: Occupational Area Structure for Section C, Division 27, Group 272 versus Available NOSS

With reference to the Table 4.12, the highlighted areas are the existing NOSS for this Section, Division and Group. The table 4.12, shows that not many NOSS have been developed for the Electrical Manufacturing Industry as currently in the NOSS registry, most NOSS that have been developed focus on installation, maintenance and repair. Therefore there should be a development of the NOSS for the other job areas other than Energy Storage Device starting at the entry levels, level 1-3.

4.6 Occupational Description (OD)

The OD describes the occupations under the industry's OS in terms of competencies and duties that are designated to be performed by competent personnel. The OD are usually referred by JPK's certified facilitators prior to the development of the relevant NOSS. The OD can also be referred by potential job candidates, students, academicians, skills training trainers and industry practitioners. Academic institutions or skills training institutions may also refer to the OD to develop their curriculum as they will be able to understand what is required and expected of those in the particular occupations. Please refer to the details of these OD in Annex 4 of this report.

The OD has five (5) parts, which includes (an example is shown below):

- Sub-sector, Job Area, MSIC Details related to the Job Title
- Job Title
- List of Responsibilities
- Knowledge, Skills and Attributes

A sample of the OD is included in Figure 4.1.

MSIC GROUP: 274 AREA : LIGHTING EQUIPMENT DESIGN LEVEL : 3

Responsibilities:

An Assistant Lighting Equipment Technical Executive is responsible to assist in the design and manufacturing of electrical lighting for household and industrial applications. They often work in product evaluation, testing, and use measuring and diagnostic devices to adjust and, test. They can also be involved in the design and manufacture of lighting equipment.

Knowledge:

- Test procedures and regulations.
- Design standards.
- The standards and requirements of countries that they will export to.
- How to carry out test procedures for the product.
- Various test equipment and their functions.
- Test equipment calibration.

Skills:

- Conduct Insulation test, impedance test, conductivity test and strength test
- Set up and Conduct Mock up test conduct Lumens testing if it reaches the required lumens
- Set up and conduct weathering test for outdoor lighting subjecting the device to outdoor conditions
- Subject the device to ("Burn test) with regards to device lifespan
- Ensure that the product complies to the safety standards required
- Record test results, prepare and submit to Superior
- Able to carry out and maintain proper recording
- Ability to read and interpret technical drawings
- Set up and using test equipment

Attribute (Attitude/Safety/Environmental):

- Diligent in carrying out his job scope
- Use of Personal Protective Equipment (PPE)
- Observe safety regulation when doing tests
- Ability to receive and carry out instructions from superiors
- Good interpersonal skills with good attention to details
- High level of commitment and strong team player
- Ability to work under pressure

Figure 4.1: Sample of Occupational Description (OD)

4.7 Skills in Demand

This section elaborates on the survey findings regarding jobs and skills in demand.

4.7.1 Jobs In Demand

The jobs in demand as stated in the Table 4.13 below were obtained from document analysis, survey findings and discussion in FGD workshops.

No.	Sub-sector -	Factor(s) contributing to	Specific requirements
	Area/Job titles	the demand	and skills
1.	Production Operator	 Increase of regional demand. Medium labour cost. 	 Communication skills Able to read and write Skills in utilising basic computer function of various systems used at the production line such as real time monitoring, automation systems etc. Adapt to automation skills set
2.	Energy Converter Design Engineer	 Increase demand of renewal energy production. 	 Knowledge and skills in electrical cables design
3.	Energy Storage Design Engineer	 Battery Assembly process No structured training for the trade. New demands with emergence of new market segment. 	 Battery assembly process that requires specific skills with deep knowledge and understanding of battery structures, materials, repair instructions and technical drawing.

Table 4.13: Jobs in Demand

4.7.2 Skills Gaps

In addition to the specific job titles in demand as highlighted above, the Electrical Equipment Manufacturing Industry is in demand of workers who demonstrate the skills as stated in the Table 4.14 below:

Table 4.14: Skills Gaps

No.	Sub-sector – Area/Job titles	Factor(s) contributing to the demand	Specific requirements and skills
1.	Energy Storage Devices Production		

	Battery Assembly	 No structured training for the trade. New demands with emergence of new market segment. 	 Battery assembly process that requires specific skills with deep knowledge and understanding of battery structures, materials, repair instructions and technical drawing.
2.	Rectifier Design		
	Energy Converter Lighting Equipment	 Currently the products are imported from other countries. The need to produce the products locally. Increase of demand from telecommunication companies for transformer-less device Therefore, designer requires knowledge and skills to develop rectifier. 	 Rectifier design process requires specific skills with knowledge and understanding of new energy converter technology.
3.	Communication (Eng	glish)	
	Overall for all job areas	 Lack of ability to understand verbal or written instructions 	Training in communication at the workplace
4.	Trouble shooting an	d Problem solving skills	
	Overall for all job areas	 Lack of exposure to real working environment problems 	 Training and personal development

		Staff are not resourceful	Review of syllabus at
		when solving problems	training centre or
			universities
5.	Basic problem solving and escalation of issues to superior		
	Overall for all job	 Lack of accountability 	Training and personal
	areas		development
			 Review of syllabus at
			training centre or
			universities

4.7.3 Emerging Skills

The following Table 4.15 depicts the emerging skills as highlighted by the industry.

No.	EMERGING SKILLS	AREAS/JOB TITLES	REASON OF REQUIRED EMERGING SKILLS
1.	Rectifier Design	Energy Storage	Currently the products
		Devices	are imported from other
		Lighting Equipment	countries.
			• The need to produce
			the products locally.
			Increase of demand
			from telecommunication
			companies for
			transformer-less device
			• Therefore, designer
			requires knowledge and
			skills to develop
			rectifier.
2.	IR 4.0 related skills –	All Sub-sectors	Increase productivity,
	Utilisation of automation		reduce cost and
	systems which include		improve efficiency
	ability to configure,		To minimise human
	utilise, debug, maintain		error
	the system		
3.	Innovation – for	All Sub-sectors	Increase productivity,
	continuous improvement		reduce cost and
			improve efficiency
			To enhance capability
			to optimise resources
			and new technology

4.8 Chapter Conclusion

The OS graphical representation shown in this chapter allows the Electrical Equipment Manufacturing Industry to be interpreted at a glance in terms of:

- a. the competency or job areas applicable to the industry; and
- the skill level of the different job titles, according to the MOSQF Level Descriptors, and the available career paths. It also links the industry segmentation of sub-sectors to the MSIC Divisions and Groups.

This chapter has also presented the findings regarding the jobs and skills in demand, and the proposed steps to be taken to bridge the skills gaps. The most common skills in demand highlighted were related to battery assembly, rectifier and problem solving skills. Emerging skills mainly revolved around Industry 4.0 skills and skills required to implement continuous improvement.

In total there are 85 jobs have been identified, which covers all the MSIC Groups of Section C and Division 27. The majority of job titles are at level 4, level 5 and level 6, which comprise mostly of technical executives, assistant engineers and engineers. This is the current demand of workers who are capable of planning, analysis and design, especially with the advent of Industry 4.0 which requires workers to shift their skill sets to be more creative at problem solving and optimising process. There are 30 jobs that require the skills set of Industry 4.0.

CHAPTER 5: DISCUSSION, RECOMMENDATION & CONCLUSION

5.1 Discussion

The Electrical Equipment Manufacturing Industry can be considered as an established segment of the manufacturing industry. Though the technologies are not as fast paced compared to its counterpart, the Electronics Manufacturing Industry, it is still one of the main contributors to the nation's economy.

The analysis findings have shown that the industry is fairly structured and has similarities between the different sub-sectors, which are the main job areas of design, manufacturing and quality assurance. This allows for easier scalability of the industry in terms of introduction of new technologies especially in energy renewal and electricity saving devices. Being an established industry that still thrives economically, the industry faces few skills shortages but gaps are seen more on shifting the skills sets of its workers to be more productive, capable of optimising production, surviving in a robust economy and ultimately being globally competitive. The skills gaps that have been identified generally involve problem solving skills and being more innovative in the latest technologies and the advent of Industry 4.0.

The NOSS can act as a tool to bridge the skills gaps as identified in the Chapter 4, this is because the NOSS is based on input from the industry to deliver skills training and has a component of hands on training and practical skills assessment.

5.2 Recommendations

The following are specific recommendations proposed to address the issues of skills gaps and to fill jobs in demand highlighted in this document.

5.2.1 NOSS Development and Review

Table 4.11 in Chapter 4 shows how the existing NOSS which are related to the Electrical Equipment Manufacturing Industry that correspond to the relevant job areas identified in the OS.

5.2.2 Encourage Apprenticeship Training (National Dual Training System - NDTS)

Apprenticeship training (National Dual Training System - NDTS) should be implemented for training in courses related to the industry. The NDTS allows trainees to concurrently undergo blocks of theoretical classes and practical training in the actual working environment. This is to address the need to expose potential job candidates to the working environment prior to their job entry.

5.2.3 Recognition of Prior Achievements (Pengiktirafan Pencapaian Terdahulu (PPT))

One of the methods of certification by JPK, which is the Recognition of Prior Achievements (*Pengiktirafan Pencapaian Terdahulu (PPT*)), should be implemented so that experienced personnel who meet the specified requirements under the PPT programme are awarded with the relevant Malaysian Skills Certificate (*Sijil Kemahiran Malaysia – SKM*) by JPK, thus enabling career progression and up-skilling.

5.3 Chapter Conclusion

The conclusion is divided based on the earlier objectives of the OF research as elaborated below:

Conclusion for Objective 1: Occupational Structure

The occupational analysis conducted has identified 6 main sub-sectors under the Electrical Equipment Manufacturing Industry and 85 job titles. Please refer to Chapter 4 (Occupational Structure) and Table 4.3 (Summary of Job titles) for details. These subsectors are segmented based on the MSIC and industry input. The areas are also listed below:

- a. Energy Converter (MSIC Group 271)
- b. Energy Storage Devices (MSIC Group 272)
- c. Electrical Cables (MSIC Group 273)
- d. Electrical Energy Equipment (MSIC Group 279)
- e. Lighting Equipment (MSIC Group 274)
- f. Consumer Product (MSIC Group 275)

Conclusion for Objective 2: Occupational Descriptions

Samples of Occupational Descriptions for job areas in the Industry OS are included in Annex 4. This may serve as reference of job scope and the required competencies for the purpose of NOSS development. The OD have also been developed in a way that will make it easier to be referred in terms of NOSS development because it includes the main elements of the NOSS curriculum which are MSIC details, skills, knowledge and attributes such as attitude and safety.

Conclusion for Objective 3: Skills in Demand

The skills gaps identified based on industry input are such as below:

- a. Battery Assembly
- b. Rectifier Design
- c. Communication skills
- d. Trouble shooting skills
- e. Problem solving skills
- f. Skills to escalate issues to superior

Emerging skills which are mainly related to Industry 4.0 are used for continuous improvement and also seen to be in demand by the industry in the near future. Thus, should be embedded in the NOSS.

Conclusion for Objective 4: Critical Jobs

Jobs in demand, or commonly known by JPK as "Critical Job Titles", are identified based on the following scenarios in order of importance:

- a. Shortages of skilled workers supply in the industry
- b. Shortages of workers for a particular job area in the industry
- c. Strategic assessment in terms of direction for both short term and long term periods
Below is the list of Critical Job Titles:

No	Critical Job Title	Area	Level
1	Assistant Energy Converter	Energy Converter Design	13
	Technical Executive	Energy converter Design	20
2	Energy Converter Technical	Energy Converter Design	14
۷.	Executive	Energy Converter Design	
3	Assistant Energy Converter Design	Energy Converter Design	15
3.	Engineer		20
4.	Energy Converter Design Engineer	Energy Converter Design	L6
5	Energy Storage Design Engineer	Energy Storage Devices	16
5.	Energy Storage Design Engineer	Design	20
6.	Electrical Cables Design Engineer	Electrical Cables Design	L6

Table 5.1: List of Critical Job Titles

Based on the survey findings and focus group discussions, a total of 6 job titles have been identified to be Critical Jobs. These job titles are in demand due to an increase of regional demand for renewal energy/ energy converter equipment.

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ANNEX 1

MOSQF LEVEL DESCRIPTORS

MALAYSIAN OCCUPATIONAL SKILLS QUALIFICATION FRAMEWORK (MOSQF) LEVEL DESCRIPTOR

LEVEL	LEVEL DESCRIPTION
	Achievement at this level reflects the ability to develop original understanding and extend
	a sub-area of knowledge or professional practice. It reflects the ability to address problematic
	situations that involve many complexes, interacting factors through initiating, designing and
8	undertaking research, development or strategic activities. It involves the exercise of broad
	autonomy, judgement and leadership in sharing responsibility for the development of a field of
	work or knowledge, or for creating substantial professional or organisational change. It also
	reflects a critical understanding of relevant theoretical and methodological perspectives and
	how they affect the field of knowledge or work.
	Achievement at this level reflects the ability to reformulate and use relevant understanding,
	methodologies and approaches to address problematic situations that involve many
7	interacting factors. It includes taking responsibility for planning and developing courses of
	action that initiate or underpin substantial change or development, as well as exercising broad
	autonomy and judgment. It also reflects an understanding of theoretical and relevant
	methodological perspectives, and how they affect their sub-area of study or work.
	Achievement at this level reflects the ability to refine and use relevant understanding, methods
	and skills to address complex problems that have limited definition. It includes taking
6	responsibility for planning and developing courses of action that are able to underpin
	substantial change or development, as well as exercising broad autonomy and
	judgment. It also reflects an understanding of different perspectives, approaches of schools
	of thought and the theories that underpin them.
	Competent in applying a significant range of fundamental principles and complex
	techniques across a wide and often unpredictable variety of contexts. Very substantial
5	personal autonomy and often significant responsibility for the work of others and for the
0	allocation of substantial resources feature strongly, as do personal accountabilities for
	analysis and diagnosis, design, planning, execution and evaluation. Specialisation of
	technical skills should be demonstrated.
	Competent in performing a broad range of complex technical or professional work
4	activities carried out in a wide variety of contexts and with a substantial degree of personal
-7	responsibility and autonomy. Responsibility for the work of others and allocation of resources
	is often present. Higher level of technical skills should be demonstrated.

3	Competent in performing a broad range of varied work activities, performed in a variety of
	context, most of which are complex and non-routine. There is considerable responsibility
	and autonomy and control or guidance of others is often required.
	Competent in performing a significant range of varied work activities, performed in a variety
2	of context. Some of the activities are non-routine and required individual responsibility and
	autonomy.
1	Competent in performing a range of varied work activities, most of which are routine and
	predictable.

(Source: JPK. 2013)

ANNEX 2

LIST OF CONTRIBUTORS

LIST OF OCCUPATIONAL FRAMEWORK DEVELOPMENT PANEL MEMBERS

NO	NAME	POSITION	ORGANISATION	MSIC GROUP
1.	Azizam Bin Abu Bakar	Senior Engineer	Johnson Controls Hitachi Sdn. Bhd.	275
2.	Loke Koon Wah	Production Manager	APM Auto Electric Sdn. Bhd.	271
3.	Ismail Bin Abu Talib	Manager	Arbex Corp (M) Sdn. Bhd.	272
4.	Zen Azhar Bin Shuib	Manager	Southern Cable Sdn. Bhd.	273
5.	Christopher Rajaselvan	Director	Puncak Enviro Sdn. Bhd.	274
6.	Michael Maniyarasu Sanjeevi	Chargeman	Gumi Asli Elektrikal Sdn. Bhd.	274
7.	Saiffulsam Bin Hassan	Senior Engineer	SIRIM Berhad	271, 272, 273, 274 & 275
8.	Aida Syukrena Binti Mohd. Idris	Senior Principal Assistant Director	Sectoral Policy, Ministry of International Trade and Industry (MITI)	271, 272, 273, 274 & 275
9.	Norhizam Bin Ibrahim	Senior Deputy Director	Electrical & Electronics Division, Malaysian Investment Development Authority (MIDA)	271, 272, 273, 274 & 275

LIST OF OCCUPATIONAL FRAMEWORK EVALUATION PANEL MEMBERS

NO	NAME	POSITION	ORGANISATION
1.	Assoc. Prof. Ir. Dr. Nasharuddin Bin Zainal	Associate Professor	Universiti Kebangsaan Malaysia
2.	Tn. Hj. Zolkapali Bin Hj. Talib	Advisor/Consultant	Hitachi Electronics Products (M) Sdn. Bhd.
3.	Muhammad Ramzul Bin Abu Bakar	Senior Assistant Director	Electrical & Electronics Division, Malaysian Investment Development Authority (MIDA)
4.	Nooraizuraa Binti Ramly	Head of Section	HR & Administration, Tenaga Switchgear Sdn. Bhd.
5.	Mazwin Binti Mohd. Rosli	Senior Engineer	Tenaga Switchgear Sdn. Bhd.
6.	Hamdan Bin Muhamad Isa	Assistant Director	Department of Statistics Malaysia
7.	Rabi'atul'adawiah Binti Shabli	Statistician	Department of Statistics Malaysia
8.	Ratana Binti Sarimin	Senior Assistant Director	Institute for Labour Market Information and Analysis (ILMIA)

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NO	NAME	POSITION/ ORGANISATION
1.	Tn. Hj. Mohd. Yazid Bin Awalludin	Director, NOSS Division, Department of Skills Development
2.	Siti Hasmah Binti Mustapha	Principal Assistant Director, NOSS Division, Department of Skills Development
3.	Ahmad Azran Bin Ranaai	Senior Assistant Director, NOSS Division, Department of Skills Development
4.	Noor Azura Binti Adnan	Senior Assistant Director, NOSS Division, Department of Skills Development
5.	Noorita Binti Lateh	Senior Assistant Director, NOSS Division, Department of Skills Development
6.	Jefrizain Bin Abdul Rasid	Assistant Director, NOSS Division, Department of Skills Development
7.	Zainal Bin Abd. Jalil	Assistant Skills Development Officer, NOSS Division, Department of Skills Development

LIST OF RESEARCH TEAM AND SECRETARIAT

NO	NAME	POSITION/ORGANISATION
1.	Dr. Amiron Bin Ismail	Facilitator/Researcher, Precious Galaxy
2.	Dr.Azhari Bin Jamaludin	Researcher, Precious Galaxy
3.	Ahmad Ramdan Bin M Yusof	Co-Facilitator/Documenter
4.	Cristnorish Lianu	Secretariat, Precious Galaxy
5.	Khairul Alia Binti Mohd Kharuddin	Proof Reader, Precious Galaxy

ANNEX 3

QUESTIONNAIRE

ELECTRICAL EQUIPMENT MANUFACTURING SECTOR OCCUPATIONAL FRAMEWORK SURVEY

2018

ELECTRICAL EQUIPMENT MANUFACTURING SECTOR

OCCUPATIONAL FRAMEWORK SURVEY

In collaboration with the Department of Skills Development (DSD), the researcher is currently conducting an analysis on the Occupational Framework of the Electronics and Electrical Manufacturing Industry. From this analysis, the industry framework, occupational structure, occupational job titles, and job description will be summarised for the use of the Government, private sector, investors, employers, employees, educators or any personnel involved either directly or indirectly with this industry.

The main objective of this research is to enhance skills training starting from the entry level position for any job in this industry based on input from the industry. It will also provide a reference competency for skills required by workers to perform as required in the industry.

This survey will be used as field data in order to conduct a comprehensive analysis of the Occupational Framework in the industry. The target group for this survey is the organisation's representative either from the Human Resource Department or personnel at Management level.

We would like to extend our heartfelt gratitude upon your cooperation in answering this survey. Please fill in where necessary in the forms provided. Do advise us if you wish to remain anonymous in your survey response. There will be further communication with survey respondents in order to verify our findings. The completed questionnaire can be emailed to: **Person in Charge, Dr. Amiron Ismail: pritec_academy@yahoo.com**

Survey Respondent Details

Name	:
Position	:
Organisation	:
Date	:

Please answer the questions below in the space provided, additional pages may be added if necessary.

IMPORTANT NOTE:

The job areas stated in this questionnaire do not include the common job areas available in other industries such as below

- Human Resource
- Accounts and Finance

2. SEGMENTATION OF INDUSTRY

Below is the segmentation of the industry as defined in the Malaysian Industrial Standard Classification (MSIC) document produced by the Department of Statistics Malaysia, as shown in Figure 1.Kindly read through and proceed to answer question 1(a) on page 65.

(1) Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	(2) Manufacture of batteries and accumulators	(3) Manufacture of wiring and wiring devices	(4) Manufacture of electric lighting equipment	(5) Manufacture of domestic appliances	(6) Manufacture of other electrical equipment
 Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus Manufacture of electric motors, generators and transformers 	 Manufacture of batteries and accumulators Manufacture of non- rechargeable and rechargeable batteries Manufacture of primary cells and primary batteries (e.g. Cells containing manganese 	 Manufacture of fibre optic cables Manufacture of other electronic and electric wires and cables Manufacture of other electronic and electric wires and cables Manufacture of other electronic and electric wires and cables Manufacture of fibre optic 	 Manufacture of electric lighting equipment Manufacture of electric light bulbs and tubes and parts and components manufacture of lighting fixtures manufacture of non-electrical lighting equipment Manufacture of lighting fixture 	 Manufacture of domestic appliances Manufacture of refrigerators, freezers Manufacture of dishwashers, washing and drying machines manufacture of vacuum cleaners, floor polishers, waste disposers Manufacture of grinders, blenders, juice squeezers, tin openers, electric 	Manufacture of other electrical equipment

Fig.1: Products based on the of Industry's Segmentation

(1) Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	(2) Manufacture of batteries and accumulators	(3) Manufacture of wiring and wiring devices	(4) Manufacture of electric lighting equipment	(5) Manufacture of domestic appliances	(6) Manufacture of other electrical equipment
	 dioxide, mercuric dioxide, silver oxide, etc.) Manufacture of electric accumulator, including parts thereof (e.g. Separators, containers, covers) Manufacture of lead acid batteries Manufacture of nickel cadmium batteries Manufacture of lithium batteries 	cables for data transmission or live transmission of images • Manufacture of insulated wire and cable, made of steel, copper, and aluminium	components (except current- carrying wiring devices) manufacture of lighting equipment for motor vehicles, ships, aircraft	 shavers and other electric personal care device Manufacture of ventilating or recycling hoods manufacture of ceiling fans or bath fans with integrated lighting fixtures Manufacture of electric water heater, electric blankets, electric hair dryers, electric smoothing irons, household-type fans, electric ovens, microwave ovens, cookers, hotplates, toasters, coffee or tea makers, fry pans, 	

(1) Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	(2) Manufacture of batteries and accumulators	(3) Manufacture of wiring and wiring devices	(4) Manufacture of electric lighting equipment	(5) Manufacture of domestic appliances	(6) Manufacture of other electrical equipment
	 Manufacture of dry charge batteries Manufacture of wet charge batteries Manufacture of other types of batteries and accumulators n.e.c. (not elsewhere classified) 			 roasters, grills, electric heating Manufacture of non- electric space heaters, cooking ranges, grates, stoves, water heaters, cooking appliances, etc. Manufacture of other household and domestic electric appliances 	

1 (a): Please tick your industry segment based on the details of the industry segmentation provided above.

	Manufacture of electric motors, generators, transformers and electricity	
(1)	distribution and control apparatus	
(2)	Manufacture of batteries and accumulators	
(3)	Manufacture of wiring and wiring devices	
(4)	Manufacture of electric lighting equipment	
(5)	Manufacture of domestic appliances	
(6)	Manufacture of other electrical equipment	

Below are samples of **Occupational Structures** according to levels of competency and career paths for various jobs in the industry. Please proceed to the question 1 (b) on page 68.

MSIC SECTION	C MANUFACTURING					
MSIC DIVISION	27 - MANUFACTURE OF ELECTRICAL EQUIPMENT					
MSIC GROUP (Sub Sector)	271 - Manufacture of Electric Motors, Generators, Transformers and Electricity Distribution and Control Apparatus			272 - Manufacture Of Batteries And Accumulators		
Area	Energy Converter Design	Energy Converter Production	Energy Converter Quality Assurance	Energy Storage Devices Design	Energy Storage Devices Production	Energy Storage Devices Quality Assurance
LEVEL 8	Principal Electrical Energy Specialist					
LEVEL 7	Energy Converter Specialist			Energy Storage Specialist		
LEVEL 6	Energy Converter Design Engineer	Energy Converter Production Engineer	Energy Converter Quality Engineer	Energy Storage Design Engineer	Energy Storage Production Engineer	Energy Storage Quality Engineer
LEVEL 5	Assistant Energy Converter Design Engineer	Assistant Energy Converter Production Engineer	Assistant Energy Converter Quality Engineer	Assistant Energy Storage Design Engineer	Assistant Energy Storage Production Engineer	Assistant Energy Storage Quality Engineer
LEVEL 4	Energy Converter Technical Executive	Energy Converter Production Executive	Energy Converter Quality Inspector	Energy Storage Technical Executive	Energy Storage Production Executive	Energy Storage Quality Inspector
LEVEL 3	Assistant Energy Converter Technical Executive	Energy Converter Production Supervisor	No Level	Assistant Energy Storage Technical Executive	Energy Storage Production Supervisor	No Level
LEVEL 2	No Level	Senior Energy Converter Production Operator	No Level	No Level	Senior Energy Storage Production Operator	No Level
LEVEL 1	No Level	Energy Converter Production Operator	No Level	No Level	Energy Storage Production Operator	No Level

Table 1: Occupational Structure for Sections C, Division 27, Group 271 & 272

Table 2: Occupational Structure for Sections C, Division 27, Group 273 & 279

MSIC SECTION	C MANUFACTURING					
MSIC DIVISION	27 - MANUFACTURE OF ELECTRICAL EQUIPMENT					
MSIC GROUP (Sub Sector)	273 - Manufacture of Wiring And Wiring Devices			279 - Manufacture of Other Electrical Equipment		
Area	Electrical Cables Design	Electrical Cables Production	Electrical Cables Quality Assurance	Electrical Energy Equipment Design	Electrical Energy Equipment Production	Electrical Energy Equipment Quality Assurance
LEVEL 8			Principal Elec	trical Energy Specialist		
LEVEL 7	Electrical Cables Specialist			Electrical Equipment Specialist		
LEVEL 6	Electrical Cables Design Engineer	Electrical Cables Production Engineer	Electrical Cables Quality Engineer	Electrical Equipment Design Engineer	Electrical Equipment Production Engineer	Electrical Equipment Quality Engineer
LEVEL 5	Assistant Electrical Cables Design Engineer	Assistant Electrical Cables Production Engineer	Assistant Electrical Cables Quality Engineer	Assistant Electrical Equipment Design Engineer	Assistant Electrical Equipment Production Engineer	Assistant Electrical Equipment Quality Engineer
LEVEL 4	Electrical Cables Technical Executive	Electrical Cables Production Executive	Electrical Cables Quality Inspector	Electrical Equipment Technical Executive	Electrical Equipment Production Executive	Electrical Equipment Quality Inspector
LEVEL 3	Assistant Electrical Cables Technical Executive	Electrical Cables Production Supervisor	No Level	Assistant Electrical Equipment Technical Executive	Electrical Equipment Production Supervisor	No Level
LEVEL 2	No Level	Senior Electrical Cables Production Operator	No Level	No Level	Senior Electrical Equipment Production Operator	No Level
LEVEL 1	No Level	Electrical Cables Production Operator	No Level	No Level	Electrical Equipment Production Operator	No Level

Table 3: Occupational Structure for Sections C, Division 27, Group 274 & 275

MSIC SECTION	C - MANUFACTURING					
MSIC DIVISION	27 - MANUFACTURE OF ELECTRICAL EQUIPMENT					
MSIC Group (Sub Sector)	274 - Manufacture of Electric Lighting Equipment			275 - Manufacture of Domestic Appliances		
Area	Lighting Equipment Design	Lighting Equipment Production	Lighting Equipment Quality Assurance	Consumer Product Design	Consumer Product Production	Consumer Product Quality Assurance
LEVEL 8			Principal Electrical	Equipment Specialist		
LEVEL 7	Lighting Equipment Specialist			Consumer Product Specialist		
LEVEL 6	Lighting Equipment Design Engineer	Lighting Equipment Production Engineer	Lighting Equipment Quality Engineer	Consumer Product Design Engineer	Consumer Product Production Engineer	Consumer Product Quality Engineer
LEVEL 5	Assistant Lighting Equipment Design Engineer	Assistant Lighting Equipment Production Engineer	Assistant Lighting Equipment Quality Engineer	Assistant Consumer Product Design Engineer	Assistant Consumer Product Production Engineer	Assistant Consumer Product Quality Engineer
LEVEL 4	Lighting Equipment Technical Executive	Lighting Equipment Production Executive	Lighting Equipment Quality Inspector	Consumer Product Design Technical Executive	Consumer Product Production Executive	Consumer Product Quality Inspector
LEVEL 3	Assistant Lighting Equipment Technical Executive	Lighting Equipment Production Supervisor	Lighting Equipment Quality Technician	Assistant Consumer Product Design Technical Executive	Consumer Product Production Supervisor	Consumer Product Quality Technician
LEVEL 2	No Level	Lighting Equipment Production Operator	Assistant Lighting Equipment Quality Technician	No Level	Consumer Product Production Operator	Assistant Consumer Product Quality Technician
LEVEL 1	No Level	No Level	No Level	No Level	No Level	No Level

1(b): Kindly provide a sample of the organisation chart used in your organisation showing the different departments and occupational areas.

1(c): Do you agree with the proposed (General) Occupational Structure for this industry? If not, kindly elaborate your reasons.

SECTION 2: JOBS IN DEMAND

Please fill in the job(s) currently in demand in your organisation and factors contributing for the demand.

No.	Job Area (Divisions / Departments /	Job Titles (Positions)	Factor(s) contributing to the demand	
1	Energy Storage Devices /	Energy Storage Production	1 Increase of regional demand	
(e.g.)	Production	Operator	 Medium labour cost. 	
2. (e.g.)	Electrical Cables/ Design	Electrical Cables Design Engineer	Increase demand of renewal energy production.	
3.				

SECTION 3: SKILLS GAP(S)

Please provide the factors contributing to skills gaps and the description of the skills as required in your organisation.

No.	Skills In Demand	Factor(s) contributing to the demand	Description of the skills in demand
1. (e.g.)	Battery Assembly	 No structured training for the trade. New demands with emergence of new market segment. 	Battery assembly process that requires specific skills with deep knowledge and understanding of battery structures, materials, repair instructions and technical drawing.
2.			

SECTION 4: EMERGING SKILL(S)

Please fill in the emerging skills required for the job area relevant to your organisation. (Skills that are not yet core but required in the near future, if any.)

No.	Emerging Skill(s)	Relevant Job Area(s)	Factor(s) contributing to the	Description of the emerging
			demand of the emerging skills	skill(s)
1. (e.g.)	Rectifier Design	Energy Storage Devices Lighting Equipment	 Currently the products are imported from other countries. The need to produce the products locally. Increase of demand from telecommunication companies for transformer- less device Therefore, designer requires knowledge and skills to 	Rectifier design process requires specific skills with knowledge and understanding of new energy converter technology.
			develop rectifier.	
2.				

End of Questionnaire.

Thank you for your cooperation.

Should you have any questions or inquiries concerning completing this survey, please contact:

Dr. Amiron Ismail : pritec_academy@yahoo.com

Tel No. 011-55052815

ANNEX 4 : CRITICAL OCCUPATIONAL DESCRIPTIONS (OD)

MSIC GROUP: 271

AREA : ENERGY CONVERTER DESIGN LEVEL : 3

Responsibilities:

An Assistant Energy Converter Technical Executive is responsible to assist the energy converter design engineer and technical executive in the design and during manufacturing of energy converter product s for household and industrial applications. They often work in product evaluation, testing, and use measuring and diagnostic devices to adjust and prepare jig to test product. They can also be involved in the production processes.

Knowledge:

- Test procedures and regulations.
- Standards requirements for energy converter in Malaysia.
- International standards and requirements.
- How to design and carry test procedures for the products.
- Various test equipment and their functions.
- How to use design software.
- Power electronics is a must.
- Capacitor, inductors, MOSFET and other electronics component.
- Setting up and using test equipment.

Skills:

- Work together with design engineer group during set up and test product.
- Prepare document for test products/circuits.
- Identify components/parts required through technical drawings.
- Set up and use test equipment according to procedures.
- Utilise measuring and diagnostic devices to adjust and prepare jig to test product.

- Diligent in carrying out job scope.
- Use of PPE when required.
- Follow safety regulation when conducting tests.
- Good interpersonal skills with good attention to details.
- High level of commitment and strong team player.

MSIC GROUP: 271

AREA : ENERGY CONVERTER DESIGN LEVEL : 4

Responsibilities:

An Energy Converter Technical Executive is responsible to ensure the design engineers have enough resources for the product design stage and prepare all components, documents and standards required by the Design Engineer.

Knowledge:

- Standards requirements for energy converter in Malaysia.
- The international standards and requirements includes IP.
- How to design and carry test procedures for the products.
- Various test equipment and their functions.
- How to use design software.
- Various test equipment and their functions.
- Test equipment and calibration procedures.
- Design standards and requirements for each product.
- The IEE regulations and Intellectual Property.
- Design standards of countries that they will export to as advised by his Engineer.
- Setting up and using test equipment.
- Capacitor, inductors, MOSFET and other power electronics component.

Skills:

- Set up and conduct test during design stage.
- Prepare test circuit and record the test results.
- Present test results during meeting to Superior.
- Read and interpret technical drawings.
- Utilise measuring and diagnostic devices to adjust and prepare jig to test product.
- Check results and recognize for a deviation and if so the cause of that deviation.

- Diligent in carrying out job scope
- Use of PPE when required.
- Follow safety regulation when conducting tests.
- Ability to receive and carry out instructions from superiors.

- Good interpersonal skills with good attention to details.
- High level of commitment and strong team player.
- Ability to work under pressure.
- Able to guide the assistant technician in his job scope.
- Ensure that the subordinate observes safety regulation when doing tests.
- Must set an example to his subordinates on work ethics.

MSIC GROUP: 271 AREA : ENERGY CONVERTER DESIGN LEVEL : 5

Responsibilities:

An Assistant Energy Converter Design Engineer is responsible to assist the Engineer on test procedures and test circuitry/jigs with assistance from the Technical Executive, conduct product evaluation , ensure the design complies with all standards, ensure that the design follows standards required standard and has a clear understanding of the approving bodies and liaises with them for queries or defects, ensure that the design standards comply with the IEE regulations and the design standards of countries that they will export to as advised by the Engineer .

Knowledge:

- Design standards and regulations such as IEE, IEC, Energy Commission, and IP.
- Power electronics parts and components.
- Test procedures and test equipment utilisation procedures.
- Test equipment calibration.

Skills:

- Prepare product specification for every product during test.
- Prepare test report and submit to Design Engineer.
- Counter check technical drawings for accuracy.
- Troubleshoot circuitry and conduct simple test to identify functionality of product.
- Check that staff is performing according to targets set.
- Check if all recording procedures have been adhered to in case of audit.
- Ensure that the products comply with the safety standards.
- Ensure that timelines are met.
- Ensure that test equipment is working well and calibrated.
- Analyse results and cause of any deviation.
- Conduct self-evaluation on his staff and ensure that all procedures are executed.

- Able to guide assistant technician and executive in their job scope.
- Ability to work on own, semi-independent using management skills.
- Able to give clear instructions to subordinates.

- Ability to monitor and ensure that deadlines set are met as per target.
- Diligent in carrying out job scope.
- Advice subordinates importance of PPE and observes safety regulations are adhered to when doing tests.
- Good interpersonal skills with good attention to details.
- High level of commitment and is a strong, motivational team leader.

MSIC GROUP: 271 AREA : ENERGY CONVERTER DESIGN LEVEL : 6

Responsibilities:

An Energy Converter Design Engineer is responsible to conduct circuitry/jigs test, verify product evaluation, verify the design complies with all standards, verify that the design follows required standard and has a clear understanding of the approving bodies requirements and liaises with them for queries or defects, verify if the design standards comply with the IEE regulations and the design standards of countries that they will export to.

Knowledge:

- Design standards and regulations such as IEE, IEC, Energy Commission, and IP.
- Power electronics parts and components.
- Test procedures and test equipment utilisation procedures.
- Test equipment calibration.

Skills:

- Plan product specification for every product during test.
- Verify test report.
- Verify if all recording procedures have been adhered to in case of audit.
- Verify the products comply with the safety standards.
- Verify check technical drawings for accuracy.
- Verify that test equipment is working well and calibrated.
- Verify results and cause of any deviation.
- Plan timelines and deliverables.

- Able to guide assistant technician and executive in job scope.
- Ability to work on own, semi-independent using management skills.
- Able to give clear instructions to subordinates.
- Ability to monitor and ensure that deadlines set are met as per target.
- Diligent in carrying out job scope.
- Advice subordinates the importance of PPE and observes safety regulations are adhered to when doing tests.
- Good interpersonal skills with good attention to details.

• High level of commitment and is a strong, motivational team leader.

MSIC GROUP: 272

AREA : ENERGY STORAGE DEVICES PRODUCTION LEVEL : 2

Responsibilities:

An Operator is responsible to carry out battery assembly grouping & plating, prepare plate cell according to battery model, arrange positive and negative plate in group and carry out plate curing. They may also be required to carry out battery assembly of small parts, prepare lead for burning, prepare burning equipment, produce cast terminal post, produce cast straps, produce terminal post as per requirements and produce cast straps as per requirement.

Knowledge:

- Type of plates.
- Plate sizes.
- Plate material.
- Terminal post types.
- Terminal sizes.
- Cast straps types.

Skills:

- Specify the battery plate positive and negative.
- Insert battery separator according to procedures.
- Carry out battery assembly grouping & plating.
- Prepare plate cell according to battery model.
- Arrange positive and negative plate in group.
- Carry out plate curing.
- Carry out battery assembly of small parts.
- Prepare lead for burning.
- Prepare burning equipment.
- Produce cast terminal post
- Produce cast straps.
- Produce terminal post as per requirements.
- Produce cast straps as per requirement.

- Responsible for own work area.
- Follow safety instruction.
- Follow Standard Operation Procedure.
- Wear Personal Protective Equipment.
MSIC GROUP: 272 AREA : ENERGY STORAGE DEVICES PRODUCTION LEVEL : 2

Responsibilities:

An Operator is responsible to carry out Battery Assembly Boxing, insert cells into container according to prescribed polarity arrangement, insert plate element positive and negative into cell container, adjust and aligned the group of plate element positive and negative in cell, identify positive and negative plate by model before welding, press hole at each container cell, align and centre plate cell accordingly, produce container with hole in each cell and produce boxing with group plate element as per requirements and required quantity.

Knowledge:

- Type of plates.
- Plate elements.
- Polarity arrangement.
- Boxing procedures.

Skills:

- Insert cells into container according to prescribed polarity arrangement.
- Insert plate element positive and negative into cell container.
- Adjust and align the group of plate elements; positive and negative in cell.
- Identify positive and negative plate by model before welding.
- Press hole at each container cell.
- Align and centre plate cell accordingly.
- Produce container with hole in each cell.
- Produce boxing with group plate element as per requirements and required quantity.

- Responsible for own work area.
- Follow safety instruction.
- Follow standard operation procedure.
- Wear Personal Protective Equipment.

AREA : ENERGY STORAGE DEVICES PRODUCTION LEVEL : 2

Responsibilities:

An operator is responsible to carry out jar formation, fill battery acid, identify specific gravity level, secure area before filling acid, determine type of acid, carry out setting of battery by model acid volume, carry out acid application, aware of acid hazards and measure the specific gravity using equipment (hydrometer).

Knowledge:

- Acid application.
- Acid hazards.
- Specific gravity level.
- Jar formation procedures.

Skills:

- Carry out jar formation.
- Fill battery acid.
- Identify specific gravity level.
- Secure area before filling acid.
- Determine type of acid.
- Carry out setting of battery by model acid volume.
- Carry out acid application.
- Aware of acid hazards.
- Measure the specific gravity using equipment (hydrometer).

- Responsible for own work area.
- Follow safety instruction.
- Follow standard operation procedure.
- Wear Personal Protective Equipment.

AREA : ENERGY STORAGE DEVICES PRODUCTION LEVEL : 3

Responsibilities:

A supervisor is responsible to carry out post burning & leak test, use mould to carry out post burning terminal – positive, use mould to carry out post burning terminal – negative, carry out post burning terminal at accuracy time period, carry out leak test using air pressure at each battery cell, weld the positive post terminal, weld the negative post terminal, ability to test leak within time frame at every battery cell, ability to welding post burning on time to avoid damaged battery cover, analyse the welding at the right heat and right time and analyse the joint terminal post and plate sets

Knowledge:

- Post burning terminal.
- Leak test procedures.
- Positive and negative post terminal.
- Welding procedures and techniques.

Skills:

- Use Mould to carry out Post Burning Terminal Positive.
- Use Mould to carry out Post Burning Terminal Negative.
- Carry out Post Burning Terminal at accuracy time period.
- Carry out leak test using air pressure at each battery cell.
- Weld Positive and Negative Post terminal.
- Test leak within time frame at every battery cell.
- Weld post burning on time to avoid damaged battery cover.
- Analyse welding at the right heat and right time.
- Analyse joint terminal post and plate sets.

- Responsible for own work area.
- Follow safety instruction
- Follow standard operation procedure.
- Wear Personal Protective Equipment.

AREA : ENERGY STORAGE DEVICES PRODUCTION LEVEL : 3

Responsibilities:

A Supervisor is responsible to carry out battery assembly cast on strap, burn positive plates into common strap to get element, burn negative plates into common strap to get element, identify quantity of plates before burning positive plates and identify quantity of plates before burning negative plates.

Knowledge:

- Type of plates.
- Plate sizes.
- Plate material.
- Terminal post types.
- Terminal sizes.
- Cast straps types.

Skills:

- Burn positive plate into common strap and ensure it is level and flat.
- Burn negative plate into common strap and ensure it is level and flat.
- Perform setting equipment of burning process plates into common strap.
- Produce terminal post and cast straps as per required quantity.
- Burn plate into common strap.

- Responsible for own work area.
- Follow safety instruction.
- Follows Standard Operation Procedure.
- Wear Personal Protective Equipment.

AREA : ENERGY STORAGE DEVICES PRODUCTION LEVEL : 3

Responsibilities:

A supervisor is responsible to carry out battery assembly - inter post welding, ensure inter post welding is intact, firm and strong, aligned and level, solid and adhere within cell, perform welding grouping plate in cell for joint link and has the ability to determine the welding accordingly.

Knowledge:

- Inter post welding.
- Welding grouping plate.
- Welding procedures and criteria.

Skills:

- Ensure Inter Post Welding is intact, firm and strong, aligned and level, solid and adhere within cell.
- Perform Welding grouping plate in cell for joint link.
- Ability to determine the welding accordingly.

- Responsible for own work area.
- Follow safety instruction.
- Follow standard operation procedure.
- Wear Personal Protective Equipment.

AREA : ENERGY STORAGE DEVICES PRODUCTION LEVEL : 3

Responsibilities:

A supervisor is responsible to perform lid sealing / cover heat sealing, determine exact heat to contact joint the cover and container, adjust the heat machine and timing during heat sealing, arrange related accessories for heat sealing, change the mould according to battery size, seal the cover and container, identify the top cover same as container size, identify the gap of sealing is tight, apply the air pressure in container to detect air leakage, heat seal battery cover and container, apply paste for heat seal and calibrate the heat seal machine.

Knowledge:

- Lid sealing/cover heat sealing.
- Heat requirements.
- Heat machine functionality and calibration.
- Battery and container sizes.

Skills:

- Determine exact heat to contact joint the cover and container.
- Adjust heat machine and timing during heat sealing.
- Arrange related accessories for heat sealing.
- Change mould according to battery size.
- Seal cover and container.
- Identify top cover same as container size.
- Identify gap of sealing is tight.
- Apply air pressure in container to detect air leakage.
- Heat seal battery cover and container.
- Apply paste for heat seal.
- Calibrate heat seal machine.
- Capable to service heat seal machine.

- Responsible for own work area.
- Follow safety instruction.
- Follow standard operation procedure.
- Wear Personal Protective Equipment.

AREA : ENERGY STORAGE DEVICES PRODUCTION LEVEL : 4

Responsibilities:

A supervisor is responsible to conduct inspection on battery casing and terminal post by batch, record overall battery production by batch, record battery production by model and record battery that is insufficiently charged according to MS45:2009 (SIRIM).

Knowledge:

- Battery batch are accordingly produce by production number or serial number.
- Battery with signage icon.
- Battery safety data.
- Battery labelling.

Skill:

- Analyse battery condition before charging.
- Analyse battery condition after charging.
- Analyse battery packing.
- Analyse battery wrapping.

- Responsible for own work area.
- Follow safety instruction.
- Follow standard operation procedure.
- Wear Personal Protective Equipment.

AREA : ENERGY STORAGE DEVICES DESIGN

Responsibilities:

An Energy Storage Design Engineer is responsible to conduct circuitry/jigs test, verify product evaluation, verify the design complies with all standards, verify that the design follows required standard and has a clear understanding of the approving bodies requirements and liaises with them for queries or defects, verify if the design standards comply with the IEE regulations and the design standards of countries that they will export to.

Knowledge:

- Design standards and regulations such as IEE, IEC, Energy Commission, and IP.
- Power electronics parts and components.
- Test procedures and test equipment utilisation procedures.
- Test equipment calibration.

Skills:

- Plan product specification for every product during test.
- Verify test report.
- Verify if all recording procedures have been adhered to in case of audit.
- Verify the products comply with the safety standards.
- Verify check technical drawings for accuracy.
- Verify that test equipment is working well and calibrated.
- Verify results and cause of any deviation.
- Plan timelines and deliverables.

- Able to guide the assistant technician and executive in his job scope.
- Ability to work on own, semi-independent using management skills.
- Able to give clear instructions to subordinates.
- Ability to monitor and ensure that deadlines set are met as per target.
- Diligent in carrying out job scope.
- Advice subordinates the importance of PPE and observes safety regulations are adhered to when doing tests.
- Good interpersonal skills with good attention to details.

• High level of commitment and is a strong, motivational team leader.

MSIC GROUP: 273 AREA : ELECTRICAL CABLES DESIGN LEVEL : 6

Responsibilities:

An Electrical Cables Design Engineer is responsible to conduct circuitry/jigs test, verify product evaluation, verify the design complies with all standards, verify that the design follows required standard and has a clear understanding of the approving bodies requirements and liaises with them for queries or defects, verify if the design standards comply with the IEE regulations and the design standards of countries that they will export to.

Knowledge:

- Design standards and regulations such as IEE, IEC, Energy Commission, and IP.
- Power electronics parts and components.
- Test procedures and test equipment utilisation procedures.
- Test equipment calibration.

Skills:

- Plan product specification for every product during test.
- Verify test report.
- Verify if all recording procedures have been adhered to in case of audit.
- Verify the products comply with the safety standards.
- Verify check technical drawings for accuracy.
- Verify that test equipment is working well and calibrated.
- Verify results and cause of any deviation.
- Plan timelines and deliverables.

- Able to guide the assistant technician and executive in his job scope.
- Ability to work on own, semi-independent using management skills.
- Able to give clear instructions to his subordinates
- Ability to monitor and ensure that deadlines set are met as per target.
- Diligent in carrying out job scope.
- Advise subordinates importance of PPE and observes safety regulations are adhered to when doing tests.
- Good interpersonal skills with good attention to details.

• High level of commitment and is a strong, motivational team leader.