



OCCUPATIONAL FRAMEWORK
SECTION C: MANUFACTURING
DIVISION 28: MANUFACTURE OF MACHINERY AND
EQUIPMENT N.E.C.

Department of Skills Development
Ministry of Human Resources, Malaysia

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ABSTRACT

An Occupational Framework is the outcome of Occupational Analysis of identifying the work scope of the occupational areas in terms of competencies. It is used to analyse skilled human resource competency requirement for the sector. The development of the Occupational Structure is a preliminary process in developing relevant National Occupational Skills Standard (NOSS). The NOSS in turn will be developed to be used as the basis to conduct skills training and certification of competent personnel. This document is divided into five chapters, the first two chapters being an industrial overview highlighting the definition and scope of the sector, the current analysis of the local sector and its skilled worker requirements, Government bodies and development plans supporting the growth of the sector. The third chapter will explain the methodology used in Occupational Framework development such as qualitative analysis through brainstorming discussion sessions. Workshops were held to get a better understanding of the organisational structure, job titles, hierarchy objectives and main activities of the specified positions. The final chapters will present the findings of the Occupational Framework that is translated into the Occupational Structures, levels of competencies and critical job areas. These findings will in turn be the basis of reference for the development of the NOSS document. The NOSS will serve not only as a reference of skills standards for certification but also as a guide to develop the skills training curriculum. In order to conduct the Occupational Framework on Manufacture of Machinery and Equipment (M&E), sector all the information related to the aforesaid sector was gathered through literature review, surveys and further discussed in workshop sessions with experts from the sector. The OF for M&E under Section C – Manufacturing, Division 28 – Manufacture of M&E N.E.C. This industry represents one of the most potential sectors in the economy and a key player in the next Industrial Revolution 4.0 (IR4.0). The total of job area identified is 36 with 175 job titles. A total of 48 job titles identified as relevant to IR4.0 and 70 job titles are classified as critical job titles in the industry.

ABSTRAK

Kerangka Pekerjaan (OF) adalah hasil Analisis Pekerjaan (OA) bagi mengenal pasti skop kerja pada bidang pekerjaan dari segi kecekapan. Ia digunakan bagi menganalisis keperluan kecekapan sumber manusia untuk industri ini. Pembangunan Rangka Kerja Pekerjaan (OS) adalah proses awal dalam membangunkan Standard Kemahiran Pekerjaan Kebangsaan (SKPK) yang berkaitan. SKPK pula akan dibangunkan untuk digunakan sebagai asas untuk menjalankan latihan kemahiran dan pensijilan kakitangan yang kompeten. Dokumen ini dibahagikan kepada lima bab, dua bab pertama menfokuskan kepada gambaran keseluruhan industri yang menonjolkan kepada definisi dan skop industri, analisis industri tempatan yang terkini dan keperluan pekerja mahir, badan-badan Kerajaan dan pelan pembangunan yang menyokong pertumbuhan industri. Bab ketiga akan menerangkan metodologi yang digunakan dalam pembangunan Rangka Kerja Pekerjaan seperti analisis kualitatif melalui sesi perbincangan sumbang saran. Bengkel diadakan untuk mendapatkan pemahaman yang lebih baik mengenai struktur organisasi, tajuk pekerjaan, objektif hierarki dan aktiviti utama bagi posisi yang ditentukan. Bab terakhir akan membentangkan penemuan Rangka Kerja Pekerjaan yang diterjemahkan ke dalam Rangka Kerja Pekerjaan, tahap kecekapan dan bidang kerja yang kritikal. Penemuan ini akan menjadi asas rujukan untuk pembangunan dokumen SKPK. SKPK akan berkhidmat bukan sahaja sebagai rujukan piawaian kemahiran untuk pensijilan tetapi juga sebagai panduan untuk membangunkan kurikulum latihan kemahiran. Bagi menjalankan Rangka Kerja Pekerjaan di industri Pembuatan Mesin dan Peralatan, semua maklumat yang berkaitan dengan industri yang disebut terdahulu telah dikumpulkan melalui kajian literatur, tinjauan dan perbincangan lanjut dalam sesi bengkel dengan pakar dari industri. Kerangka Pekerjaan industri Pembuatan Mesin dan Peralatan adalah berdasarkan Klasifikasi Perindustrian Piawaian Malaysia 2008 (MSIC 2008) di bawah Seksyen C – Pembuatan, Bahagian 28 – industri Pembuatan Mesin dan Peralatan *N.E.C.* Industri ini mewakili mewakili salah satu sector yang paling berpotensi dalam ekonomi dan pemain utama dalam revolusi industri seterusnya – Industri Revolusi 4.0. Jumlah bidang pekerjaan yang telah dikenalpasti adalah 36 dengan 175 tajuk pekerjaan. Sejumlah 48 tajuk pekerjaan yang dikenalpasti berkaitan dengan Industri Revolusi 4.0 dan 70 tajuk pekerjaan diklasifikasikan sebagai tajuk pekerjaan kritikal dalam industri.

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LIST OF ABBREVIATIONS

3D	Three (3) Dimensional
4D	Four (4) Dimensional
ACA	Automation Capital Allowance
ACCI	ASEAN Chambers of Commerce and Industry
ACCSQ	ASEAN Consultative Committee for Standards & Quality
AE	Automation Equipment
AFEEC	ASEAN Federation of Electrical Engineering Contractors
APEL	Accreditation of Prior Experiential Learning
ASEAN	Association of Southeast Asian Nations
BDA	Big Data Analytics
BOM	Bills of Material
CAD	Computer-Aided Design
CATIA	Computer Aided Three-dimensional Interactive Application
CBT	Competency Based Training
CIAST	Centre for Instructor and Advanced Skill Training
CIDB	Construction Industry Development Board Malaysia
CNC	Computer Numerical Control
COL	Critical Occupational List
CSC	Critical Skills Monitoring
DESCUM	Development of Standard and Curriculum
DISF	Domestic Investment Strategic Fund
DOE	Department of Environment
DOSH	Department of Occupational Safety and Health
DOSM	Department of Statistics Malaysia
DSD	Department of Skills Development
DT	Destructive Testing
DTAP	Digital Transformation Acceleration Program
ERP	Enterprise Resource Planning
FADMA	Federation of Asian Die and Mould Association
FAT	Factory Acceptance Test

LIST OF ABBREVIATIONS

FGD	Focus Group Discussion
GDP	Gross Domestic Products
GST	Goods and Service Tax
HEMMAM	Heavy Equipment and Machinery Manufacturers Association of Malaysia
HMI	Human Machine Interface
HSE	Health, Safety and Environment
IKBN	<i>Institut Kemahiran Belia Negara</i>
IKTBN	<i>Institut Kemahiran Tinggi Belia Negara</i>
ILMIA	Institute of Labour Market Information and Analysis
ILP	<i>Institut Latihan Perindustrian</i>
IMP3	Third Industrial Master Plan
IoT	Internet of Things
IR4.0	Industrial Revolution 4.0
ISIC	International Standard Industrial Classification
ISO	International Organisation for Standardisation
JSCEEE	Joint Sectoral Committee on Electrical & Electronics Equipment
KeTTHA	Ministry of Energy, Green Technology and Water
M&E	Machinery & Equipment
M2M	Machine to Machinery
MARA	<i>Majlis Amanah Rakyat</i>
MATA	Malaysia Automation Technology Association
MATRADE	Malaysia External Trade Development Corporation
MDEC	Malaysia Digital Economy Corporation
MEIF	Manufacturing & Engineering Industries Federation
MEMA	Machinery and Equipment Manufacturers Association
MIDA	Malaysian Industrial Development Authority
MITI	Ministry of Industry and International Trade
MNC	Multinational Corporation
MOHR	Ministry of Human Resources
MOSQF	Malaysian Occupational Skills Qualification Framework

LIST OF ABBREVIATIONS

MQA	Malaysia Qualification Agency
MQF	Malaysian Qualification Framework
MRO	Maintenance, Repair and Overhaul
MSC	Malaysian Skills Certificate
MSIC	Malaysian Standard Industrial Classification
MSTMA	Malaysia Special Tooling and Machining Association
N.E.C	Not Elsewhere Classified
NCS	National Competency Standard
NDT	Non-Destructive Testing
NOSS	National Occupational Skills Standard
OA	Occupational Analysis
OD	Occupational Description
OECD	Economic Co-operation and Development
OEE	Overall Equipment Effectiveness
OF	Occupational Framework
OS	Occupational Structure
OSHA	Occupational Safety and Health Act
PERKEM	<i>Persatuan Pengilang, Pembekal, Kontraktor Industri Elektrikal, Elektronik, Mekanikal Dan ICT Melayu Dan Bumiputera</i>
PLC	Programmable Logic Controllers
PPP	Public-Private Partnerships
PV	Photovoltaics
QA	Quality Assurance
R&D	Research & Development
RMCD	Royal Malaysian Customs Department
RMK 11	<i>Rancangan Malaysia Ke-11</i>
SAMENTA	Small and Medium Enterprises Association of Malaysia
SAT	Site Acceptance Test
SIRIM	Standard and Industrial Research Institute of Malaysia
SKPK	<i>Standard Kemahiran Pekerjaan Kebangsaan</i>
SME	Small and Medium Enterprise

LIST OF ABBREVIATIONS

SOP	Standard Operating Procedure
SSM	<i>Suruhanjaya Syarikat Malaysia</i>
ST	Energy Commissioning
STPM	<i>Sijil Tinggi Persekolahan Malaysia</i>
SWO	Standards Writing Organisation
TEEAM	The Electrical and Electronics Association of Malaysia
TVET	Technical and Vocational Education and Training
USA	United States of America

GLOSSARY

3R	The three Rs are basic skills taught in schools: reading, writing and arithmetic.
Computer Aided Design	The use of a wide range of computer-based tools that assist engineers, architects, and other design professionals in their design activities to create physical designs, usually three-dimensional.
Computer Numerical Control	The digital control of a physical machine that consists of a series of integrated actuators, power electronics, sensors, and dedicated computer running under a real-time operating system.
Critical Occupational List	A list of occupations for which there is strong evidence that there is significant labour market shortage that may be alleviated through government action.
Fourth Industrial Revolution (IR 40)	The current and developing environment in which disruptive technologies and trends such as the Internet of Things (IoT), robotics, Virtual Reality (VR) and Artificial Intelligence (AI) are changing the way we live and work.
Industrial Automation Engineering	A combination of electronics, mechanics, and electrical, and includes the control or interaction of computers, motors, hydraulics, pneumatics, and other processes which are applied and used within manufacturing.
Industry4WRD	Malaysia's national policy on Industry 4.0, which calls for a smarter and stronger manufacturing sector driven by people, processes, and technology. Industry4WRD is a collaborative effort between the Government, industry, and academia, aiming for enhanced productivity, greater job creation, and the creation of a high-skilled talent pool in the manufacturing sector.
Labour Demand	Indicates the total labour that the economy is willing to employ at any given point of time.
Labour Force	As the sum of persons in employment and persons in unemployment. Together these two groups of the population represent the current supply of labour for the production of goods and services taking place in a country through market transactions in exchange for remuneration.

GLOSSARY

Machinery & Equipment Industry	To catalyse Malaysia's transition into a high-technology, Industry 4.0-ready nation, due to its linkages to various large-scale economic sectors such as manufacturing and services.
Machining	Any of various processes in which a piece of raw material is cut into a desired final shape and size by a controlled material-removal process. The processes that have this common theme, controlled material removal, are today collectively known as subtractive manufacturing, in distinction from processes of controlled material addition, which are known as additive manufacturing.
Manufacturing	The process of transforming materials or components into finished products that can be sold in the marketplace.
Manufacturing industry	Are those that engage in the transformation of goods, materials or substances into new products. The transformational process can be physical, chemical or mechanical. Manufacturers often have plants, mills or factories that produce goods for public consumption. Machines and equipment are typically used in the process of manufacturing.
Occupational Description (OD)	A broad, general, and written statement of a specific job, based on the findings of a job analysis.
Occupational Framework (OF)	The outcome of Occupational Analysis of identifying the work scope of the occupational areas in terms of competencies.
Occupational Responsibilities	A duty or obligation to satisfactorily perform or complete a task (assigned by someone, or created by one's own promise or circumstances) that one must fulfil, and which has a consequent penalty for failure.
Prototype	An engineering-quality sample build of a product, typically intended to test high-risk aspects of the design.
Quality Assurance	The maintenance of a desired level of quality in a service or product, especially by means of attention to every stage of the process of delivery or production.

GLOSSARY

Quality Management	The act of overseeing all activities and tasks needed to maintain a desired level of excellence. This includes the determination of a quality policy, creating and implementing quality planning and assurance, and quality control and quality improvement.
Skilled worker	Any worker who has special skill, training, knowledge, and (usually acquired) ability in their work.
Tooling	Hardware (or software) that is developed specifically for a part so that when that tool is inserted into a general-purpose machine, that machine will produce or shape that part uniquely.

CHAPTER 1: INTRODUCTION

1.1 Introduction

As Malaysia is moving towards a highly technology Industry 4.0 (I4.0) nation sector such as Manufacture of Machinery and Equipment (M&E) industry plays an important role. According to Third Industrial Master Plan (IMP3) 2006 – 2020 Malaysia aspired to attain long-term global competitiveness through transformation and innovation investments in this industry and is targeted to grow by an average annual rate of 3.7 per cent. While by 2020, investments in the industry are estimated to reach RM30.8 billion, exports are expected to grow at an average rate of 6.7 per cent per annum, reaching RM48.3 billion. The growth is also reflected by the number of people employed in the industry where in 2019, 1,085,179 persons were at site, an increase of 1.4 per cent as compared to in May 2018¹. Due to this competitiveness, *Suruhanjaya Syarikat Malaysia (SSM)*, saw an overwhelming registration of more than 2591 companies of all sizes in the Manufacture of General-Purpose Machinery and Manufacture of Special-Purpose Machinery alone. Though there are other fields in the M&E such as including power generation, metal working, modules and industrial parts, and remanufacturing of M&E, the two most important field are leading manufacturer of general and specialised-purpose machinery. To further investigate the industry, this chapter will explain the problem statement, objectives, scope and justification MSIC Section Selection of the Occupational Framework specifically for the Manufacture of Machinery and Equipment industry.

1.2 Problem Statement

Based on record from the National Occupational Skills Standard (NOSS) Registry, there are a number of NOSS that has been developed for this industry. Currently, there are no occupational framework that has been developed for the Manufacture of machinery and equipment n.e.c under the MSIC Code C28.

¹ Malaysian Investment Development Authority. (2019, June 25). Retrieved from <https://www.mida.gov.my>

As M&E is among the catalyst for economic growth, it is important for the stakeholder of the industry to have a benchmark on human capital development planning. This analysis will also help the academic and skills training institute to develop training program that fulfil the industry requirement. This study was also important to provide further insight on industry occupational structure, job descriptions, demand for the skills, jobs title, and critical tasks skills level and identification of job classification required in correspond with NOSS based on MSIC 2008 sections and divisions.

1.3 Objective of Study

The objective of this study is to produce Occupational Structure (OS) of Machinery and Equipment (M&E) industry.

The objectives of the study are as below:

- a) To establish OS for Manufacture of M&E industry based on MSIC 2008;
- b) To establish job descriptions for each job title based on latest industry OS;
- c) To examine the skills in demand in the Manufacture of Machinery and Equipment industry;
- d) To identify jobs title related to IR4.0 in Manufacture of Machinery and Equipment industry; and
- e) To identify critical jobs in for the Manufacture of Machinery and Equipment industry.

1.4 Scope of Study

The scope of work for the study covers the Manufacturing of M&E industry in Malaysia. The target respondents of this study will be senior management personnel upwards. Qualitative and quantitative data will be collected through document analysis, focus group discussion and internet and field survey methodology. The respondent of this study will only be those working with the Manufacture of M&E industry registered with *Suruhanjaya Syarikat Malaysia* (SSM). It was reported that about 1,365 companies registered under MSIC 2008 group C281 - Manufacture of general-purpose machinery and 1,226 companies in the group C282 - Manufacture of special-purpose machinery

subsector. Consequently, this study will embark by reviewing of documents available in the present environment. This is followed by focus group interviewing the pertinent senior industry representatives to gain insight of the industry and to further develop the survey instrument to be employed in the field study. The respondents were industry expert from various level of M&E industry and covers all entire Malaysia.

1.5 Justification for Malaysian Standard Industrial Classification 2008 (MSIC 2008) Section Selection

This research aims to define industry needs with regards to its OS, Jobs in Demand and Skills in Demand using a mixed quantitative and qualitative approach. The research output can provide crucial information that help in identifying skills shortage in the industry. It can also be utilised by stakeholders to plan strategies to meet industrial needs. Hence, to Department of Statistics Malaysia (2019), the Manufacture of machinery and equipment n.e.c. industry is in tandem with description of Division 28 under Section C: This division includes the manufacture of machinery and equipment that act independently on materials either mechanically or thermally or perform operations on materials (such as handling, spraying, weighing or packing), including their mechanical components that produce and apply force, and any specially manufactured primary parts. This includes the manufacture of fixed and mobile or hand-held devices, regardless of whether they are designed for industrial, building and civil engineering, agricultural or home use. The manufacture of special equipment for passenger or freight transport within demarcated premises also belongs within this division.

1.6 Structure of Chapter

This chapter summarises the important elements of the research on the occupational framework for Manufacture of M&E n.e.c including the problem statement, objectives and scope of study as well as the justification for MSIC 2008 section selection. This research aims to define industry needs with regards to its Occupational Structure, Jobs in Demand and Competency in Demand using a mixed quantitative and qualitative approach. The research output can provide crucial information that help in identifying

skills shortage in the industry. It can also be utilised by stakeholders to plan strategies to meet industrial needs.

The brief overview of the entire study which include;

a) Chapter 1

This chapter consist of introduction to the research, problem statement, research objective, research scope and justification based on 2 digits MSIC 2008 Division 28: Manufacture of M&E n.e.c.

b) Chapter 2

Review about the research are explained in this chapter to give further understanding about the research. The information are gained from different sources such as Department of Statistics Malaysia and others.

c) Chapter 3

Overall approach and method deployed to achieve objective of the research such as focus group discussion with expert from M&E industry, survey from the company related to the industry and document analysis based on published information were explained in this chapter.

d) Chapter 4

All the results and finding on the research based on the approach and method deployed are listed in this chapter.

e) Chapter 5

This chapter explain about the discussion, summary and conclusion on the research done. Besides that, recommendation from the expert in the M&E industry are also listed here.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter will emphasis on the explanation of the Manufacture of Machinery and Equipment activities sector focusing on the current scenario in Malaysia, introduction to government policies, development plans, government bodies and competitiveness at international level.

Findings in this chapter were obtained via literature review, observation, interviews with sector practitioners and discussions during workshops with development panel members. This literature review will be further discussed with panel members to obtain insight on the matters at hand from a practitioner's perspective.

2.1.1 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 has 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.

2.1.2 Malaysian Qualification Framework (MQF)

The Malaysia Qualification Framework (MQF) refers to the policy framework that satisfies both the national and international recognised qualifications. It comprises of titles and guidelines, together with principles and protocols covering articulation and issuance of qualifications and statements of attainment. Element of qualification 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 2nd Edition has eight levels of qualification in two sectors supported by lifelong education pathways as shown in Table 2.1. The Department of Skills Development (DSD) 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) can be refer in Annex 1².

Table 2.1 Malaysian Qualification Framework (MQF) Chart

(Source: Malaysian Qualification Framework 2nd Edition, 2018)

MQF LEVEL	MINIMUM GRADUATING CREDIT	ACADEMIC SECTOR	TVET SECTOR	LIFELONG LEARNING/APEL CRITERIA FOR APEL (A)
8	No credit rating	PhD by Research		Admission criteria: 35 years old Bachelor's degree in relevant field/equivalent 5 years' work experience Passed APEL assessment
	80	Doctoral Degree by Mixed Mode & Coursework		
7	No credit rating	Master's by Research		Admission criteria: 30 years old STPM/Diploma/equivalent Relevant work experience Passed APEL assessment
	40	Master's by Mixed Mode & Coursework		

² Malaysian Qualification Agency. 2018. Malaysian Qualification Framework 2nd Edition.

MQF LEVEL	MINIMUM GRADUATING CREDIT	ACADEMIC SECTOR	TVET SECTOR	LIFELONG LEARNING/APEL CRITERIA FOR APEL (A)
	30	Postgraduate Diploma		
	20	Postgraduate Certificate		
6	120	Bachelor's degree		Admission criteria: 21 years old Relevant work experience Passed APEL assessment
	66	Graduate Diploma		
	36	Graduate Certificate		
5	40	Advanced Diploma	5	
4	90	Diploma	4	Admission criteria: 20 years old Relevant work experience Passed APEL assessment
3	60	Certificate	3	Admission criteria: 19 years old Relevant work experience Passed APEL assessment
2	30	Certificate	2	3R
1	15	Certificate	1	3R

2.1.3 Occupational Framework (OF)

The Occupational Framework (OF) is described as 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), Occupational 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 personnel³.

³ Department of Skill Development (2019, August 27) retrieved from <https://www.dsd.gov.my/jpkv4/index.php/my/>

2.1.4 National Occupational Skills Standard (NOSS)

The National Occupational Skills Standard (NOSS) is a standard document that outlines the minimum competencies required by a skilled worker working in Malaysia for a particular area and level of occupation. It also describes the path to achieve the competencies and is gazetted in Part IV of the National Skills Development Act 652. NOSS is developed by the sector experts based on the needs of the sector and is utilised as the main tool in the implementation of the Malaysian Skills Certification System in which the performance of existing sector workers and trainees are assessed based on NOSS for awarding of Malaysian Skills Certificate⁴. Meanwhile the National Competency Standard (NCS) describes the knowledge, skills and attitudes needed to perform in a particular occupation that do not directly relate to any particular job classification. Standards are developed by the industry experts based on the needs of the industry and are 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 Standards for awarding of Malaysian Skills Certificate.

2.1.5 Competency Based Training (CBT)

Competency Based Training (CBT) is an approach to vocational training which emphasizes on 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 sector with main focus on measuring the performance while considering 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 meaning training practices can be customized for each individual to achieve a similar outcome. CBT concept is the basis of Malaysian Skills Certification system which is coordinated by DSD⁵.

⁴ National Skills Development Act 652 (2019, August 27) retrieved from <http://www.agc.gov.my/agcportal/index.php>

⁵ Department of Skill Development (2019, August 27) retrieved from <https://www.dsd.gov.my/jpkv4/index.php/my/>

2.2 Scope of Occupational Framework Based on MSIC 2008

This section provides the details of MSIC 2008 scope on M&E industry. The definition and title selection criterion of MSIC 2008 are explained in this section.

2.2.1 Malaysia Standard Industrial Classification 2008 (MSIC 2008) Definition

The MSIC 2008 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 this 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 occupations⁶.

2.2.2 Title Selection Criteria

The research area is focusing on Manufacture of machinery and equipment n.e.c. as stated earlier the definition of the research area is aligned with MSIC. Based on MSIC 2008, definition and scope of coverage for the Occupational Framework is as follows Table 2.2:

Table 2.2: Summary of MSIC by Section, Division and Group
(Source: MSIC 2008)

Section	C	Manufacturing
Division	28	Manufacture of machinery and equipment n.e.c.
Group	281	Manufacture of general-purpose machinery
	282	Manufacture of special-purpose machinery

⁶ Department of Statistics Malaysia. (2008). Malaysia Standard Industrial Classification 2008 Ver.1.0.

Table 2.3 below is an excerpt taken from MSIC 2008 as to illustrate the scope of this Occupational Framework (OF).

Table 2.3: Description of MSIC classification for Section C, Division 28

(Source: MSIC 2008)

CLASSIFICATION	CODE	DESCRIPTION
SECTION	C	Manufacturing
DIVISION	28	<p>Manufacture of machinery and equipment n.e.c</p> <p>This division includes the manufacture of machinery and equipment that act independently on materials either mechanically or thermally or perform operations on materials (such as handling, spraying, weighing or packing), including their mechanical components that produce and apply force, and any specially manufactured primary parts. This includes the manufacture of fixed and mobile or hand-held devices, regardless of whether they are designed for industrial, building and civil engineering, agricultural or home use. The manufacture of special equipment for passenger or freight transport within demarcated premises also belongs within this division.</p> <p>This division distinguishes between the manufacture of special-purpose machinery, i.e.: machinery for exclusive use in an MSIC industry or a small cluster of MSIC industries, and general-purpose machinery, i.e.: machinery that is being used in a wide range of MSIC industries. This division also includes the manufacture of other special-purpose machinery, not covered elsewhere in the classification, whether or not used in a manufacturing process, such as</p>

CLASSIFICATION	CODE	DESCRIPTION
		fairground amusement equipment, automatic bowling alley equipment, etc.
CLASSIFICATION	Code	Description
GROUP	281	Manufacture of General-Purpose Machinery This group includes the manufacture of general-purpose machinery, i.e.: machinery that is being used in a wide range of MSIC industries. This can include the manufacture of components used in the manufacture of a variety of other machinery or the manufacture of machinery that support the operation of other businesses.
CLASS	2811	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
ITEM	28110	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines Includes: <ul style="list-style-type: none"> a) Manufacture of marine engines b) Manufacture of railway engines c) Manufacture of pistons, piston rings, carburettors and such for all internal combustion engines, diesel engines, etc. d) Manufacture of inlet and exhaust valves of internal combustion e) Engines f) Manufacture of steam turbines and other vapour turbines

CLASSIFICATION	CODE	DESCRIPTION
		<p>g) Manufacture of hydraulic turbines, waterwheels and regulators thereof</p> <p>h) Manufacture of wind turbines</p> <p>i) Manufacture of gas turbines, except turbojets or turbo propellers for aircraft propulsion</p> <p>j) Manufacture of boiler-turbine sets</p> <p>k) Manufacture of turbine-generator sets</p> <p>Excludes:</p> <p>a) Manufacture of electric generators (except turbine generator sets), see 27101</p> <p>b) Manufacture of prime mover generator sets (except turbine generator sets), see 27101</p> <p>c) Manufacture of electrical equipment and components of internal combustion engines, see 27900</p> <p>d) Manufacture of motor vehicle propulsion engines, see 2910</p> <p>e) Manufacture of aircraft propulsion engines, see 30300</p> <p>f) Manufacture of cycle propulsion engines, see 30910</p> <p>g) Manufacture of turbojets and turbo propellers, see 30300</p>
CLASS	2812	Manufacture of fluid power equipment
ITEM	28120	<p>Manufacture of fluid power equipment</p> <p>Includes:</p> <p>a) Manufacture of hydraulic and pneumatic components (including hydraulic pumps,</p>

CLASSIFICATION	CODE	DESCRIPTION
		<p>hydraulic motors, hydraulic and pneumatic cylinders, hydraulic and pneumatic valves, hydraulic and pneumatic hose and fittings)</p> <p>b) Manufacture of air preparation equipment to use in pneumatic systems</p> <p>c) Manufacture of fluid power systems</p> <p>d) Manufacture of hydraulic transmission equipment</p> <p>Excludes:</p> <p>a) Manufacture of compressors, see 28130</p> <p>b) Manufacture of pumps and valves for non-fluid power applications, see 28130</p> <p>c) Manufacture of mechanical transmission equipment, see 28140</p>
CLASS	2813	Manufacture of fluid power equipment
ITEM	28130	<p>Manufacture of other pumps, compressors, taps and valves</p> <p>Includes:</p> <p>a) Manufacture of air or vacuum pumps, air or other gas compressors</p> <p>b) Manufacture of pumps for liquids whether or not fitted with a measuring device</p> <p>c) Manufacture of pumps designed for fitting to internal combustion engines (e.g. Oil, water and fuel pumps for motor vehicles, etc.)</p> <p>d) Manufacture of industrial taps and valves, including regulating valves and intake taps</p> <p>e) Manufacture of sanitary taps and valves</p>

CLASSIFICATION	CODE	DESCRIPTION
		<p>f) Manufacture of heating taps and valves</p> <p>g) Manufacture of hand pumps</p> <p>Excludes:</p> <p>a) Manufacture of valves of unhardened vulcanized rubber, glass or of ceramic materials, see 22191, 2310 or 2393</p> <p>b) Manufacture of hydraulic transmission equipment, see 28120</p> <p>c) Manufacture of inlet and exhaust valves of internal combustion engines, see 28110</p>
CLASS	2814	Manufacture of bearings, gears, gearing and driving elements
ITEM	28140	<p>Manufacture of bearings, gears, gearing and driving elements</p> <p>Includes:</p> <p>a) Manufacture of ball and roller bearings and parts thereof</p> <p>b) Manufacture of mechanical power transmission equipment</p> <p>c) Manufacture of gears, gearing and gear boxes and other speed changers</p> <p>d) Manufacture of clutches and shaft couplings</p> <p>e) Manufacture of flywheels and pulleys</p> <p>f) Manufacture of articulated link chain</p> <p>g) Manufacture of power transmission chain</p> <p>Excludes:</p> <p>a) Manufacture of other chain, see 25993</p>

CLASSIFICATION	CODE	DESCRIPTION
		<ul style="list-style-type: none"> b) Manufacture of (electromagnetic) clutches, see 29300 c) Manufacture of sub-assemblies of power transmission equipment d) Identifiable as parts of vehicles or aircraft, see divisions 29 and 30
CLASS	2815	Manufacture of ovens, furnaces and furnace burners
ITEM	28150	<p>Manufacture of ovens, furnaces and furnace burners</p> <p>Includes:</p> <ul style="list-style-type: none"> a) Manufacture of electrical and other industrial and laboratory furnaces and ovens, including incinerators b) Manufacture of burners c) Manufacture of permanent mount electric space heaters, electric swimming pool heaters d) Manufacture of permanent mount non-electric household heating equipment (e.g. Solar heating, steam heating, oil heat and similar furnaces and heating equipment). e) Manufacture of electric household-type furnaces (electric forced air furnaces, heat pumps, etc.), non-electric household forced air furnaces f) Manufacture of mechanical stokers, grates, ash dischargers, etc.

CLASSIFICATION	CODE	DESCRIPTION
		Excludes: <ul style="list-style-type: none"> a) Manufacture of household ovens, see 27500 b) Manufacture of agricultural dryers, see 28250 c) Manufacture of bakery ovens, see 28250 d) Manufacture of dryers for wood, paper pulp, paper or paperboard, see 28290 e) Manufacture of medical, surgical or laboratory sterilizers, see 32500 f) Manufacture of (dental) laboratory furnaces, see 32500
CLASS	2816	Manufacture of lifting and handling equipment
ITEM	28160	Manufacture of lifting and handling equipment <p>Includes:</p> <ul style="list-style-type: none"> a) Pulley tackle and hoists, winches, capstans and jacks b) Derricks, cranes, mobile lifting frames, straddle carriers, etc. c) Works trucks, whether or not fitted with lifting or handling equipment, whether or not self-propelled, of the type used in factories (including hand trucks and wheelbarrows) d) Mechanical manipulators and industrial robots specifically designed for lifting, handling, loading or unloading e) Manufacture of conveyors, telfers (téléphériques), etc. f) Manufacture of lifts, escalators and moving walkways

CLASSIFICATION	CODE	DESCRIPTION
		<p>g) Manufacture of parts specialized for lifting and handling equipment</p> <p>Excludes:</p> <p>a) Manufacture of continuous-action elevators and conveyors for underground use, see 28240</p> <p>b) Manufacture of mechanical shovels, excavators and shovel loaders, see 28240</p> <p>c) Manufacture of industrial robots for multiple uses, see 28290</p> <p>d) Manufacture of floating cranes, railway cranes, crane-lorries, see 30110, 30200</p> <p>e) Installation of lifts and elevators, see 43291</p>
CLASS	2817	Manufacture of office machinery and equipment (except computers and peripheral equipment)
ITEM	28170	<p>Manufacture of office machinery and equipment (except computers and peripheral equipment)</p> <p>Includes:</p> <p>a) Manufacture of calculating machines</p> <p>b) Manufacture of adding machines, cash registers</p> <p>c) Manufacture of calculators, electronic or not</p> <p>d) Manufacture of postage meters, mail handling machines, collating machinery</p> <p>a) Manufacture of typewriters</p> <p>b) Manufacture of stenography machines</p> <p>c) Manufacture of office-type binding equipment</p>

CLASSIFICATION	CODE	DESCRIPTION
		<p>d) Manufacture of cheque writing machines</p> <p>e) Manufacture of coin counting and wrapping machinery</p> <p>f) Manufacture of pencil sharpeners</p> <p>g) Manufacture of staplers and staple removers</p> <p>h) Manufacture of voting machines</p> <p>i) Manufacture of tape dispensers</p> <p>j) Manufacture of hole punches</p> <p>k) Manufacture of cash registered, mechanically operated</p> <p>l) Manufacture of photocopy machines</p> <p>m) Manufacture of toner cartridges</p> <p>n) Manufacture of blackboards; white boards and marker boards</p> <p>o) Manufacture of dictating machines</p> <p>p) Manufacture of other office machinery and equipment N.E.C.</p> <p>Excludes: Manufacture of computers and peripheral equipment, see 2620</p>
CLASS	2818	Manufacture of power-driven hand tools
ITEM	28180	<p>Manufacture of power-driven hand tools with self-contained electric or non-electric motor or pneumatic drives</p> <p>Includes: Manufacture of hand tools, with self-contained electric or non-electric motor or pneumatic drives (e.g. circular or reciprocating saws, drills and hammer drills, hand held power sanders,</p>

CLASSIFICATION	CODE	DESCRIPTION
		<p>pneumatic nailers, buffers, routers, grinders, staplers, pneumatic rivet guns, etc.)</p> <p>Excludes: Manufacture of electrical hand-held soldering and welding equipment, see 27900</p>
CLASS	2819	Manufacture of other general-purpose machinery
ITEM	28191	<p>Manufacture of refrigerating or freezing industrial equipment</p> <p>Excludes:</p> <ul style="list-style-type: none"> a) Manufacture of sensitive (laboratory-type) balances, see 26512 b) Manufacture of domestic refrigerating or freezing equipment, see 27500 c) Manufacture of domestic fans, see 27500 d) Manufacture of electrical welding and soldering equipment, see 27900 e) Manufacture of agricultural spraying machinery, see 28210 f) Manufacture of metal or glass rolling machinery and cylinders thereof, see 2823, 2829 g) Manufacture of agricultural dryers, see 2825 h) Manufacture of machinery for filtering or purifying food, see 2825 i) Manufacture of cream separators, see 2825

CLASSIFICATION	CODE	DESCRIPTION
		<p>j) Manufacture of commercial clothes dryers, see 2826</p> <p>k) Manufacture of textile printing machinery, see 2826</p>
ITEM	28192	<p>Manufacture of air-conditioning machines, including for motor vehicles</p> <p>Includes:</p> <ul style="list-style-type: none"> a) Manufacture of non-domestic fans b) Manufacture of attic ventilation fans (gable fans, roof ventilators, etc.) c) Manufacture of commercial and industrial refrigerators and freezers
ITEM	28199	<p>Manufacture of other general-purpose machinery n.e.c.</p> <p>Includes:</p> <ul style="list-style-type: none"> a) Manufacture of weighing machinery, household and shop scales, etc. b) Manufacture of filtering or purifying machinery and apparatus for liquids c) Manufacture of equipment for projecting, dispersing or spraying liquids or powder (e.g. Spray guns, fire extinguishers, sandblasting machines, steam cleaning machines, etc.) d) Manufacture of packing and wrapping machinery (e.g. Filling, closing, sealing, capsuling or labelling machines, etc.)

CLASSIFICATION	CODE	DESCRIPTION
		<ul style="list-style-type: none"> e) Manufacture of machinery for cleaning or drying bottles and for aerating beverages f) Manufacture of distilling or rectifying plant for petroleum refineries, chemical industries, beverage industries, etc. g) Manufacture of heat exchangers h) Manufacture of machinery for liquefying air or gas i) Manufacture of gas generators j) Manufacture of calendaring or other rolling machines and cylinders thereof (except for metal and glass) k) Manufacture of centrifuges (except cream separators and clothes dryers) l) Manufacture of gaskets and similar joints made of a combination of materials or layers of the same material m) Manufacture of automatic goods vending machines n) Manufacture of parts for general-purpose machinery o) Manufacture of level, tape measures and similar hand tools, machinists' precision tools (except optical) p) Manufacture of non-electrical welding and soldering equipment
GROUP	282	<p>Manufacture of special-purpose machinery</p> <p>This group includes the manufacture of special-purpose machinery, i.e.: machinery for exclusive use</p>

CLASSIFICATION	CODE	DESCRIPTION
		in an MSIC industry or a small cluster of MSIC industries. While most of these are used in other manufacturing processes, such as food manufacturing or textile manufacturing, this group also includes the manufacture of machinery specific for other (non-manufacturing industries), such as aircraft launching gear or amusement park equipment.
CLASS	2821	Manufacture of agricultural and forestry machinery
ITEM	28210	Manufacture of agricultural and forestry machinery Includes: <ul style="list-style-type: none"> a) Manufacture of tractors used in agriculture and forestry b) Manufacture of walking (pedestrian-controlled) tractors c) Manufacture of mowers, including lawnmowers d) Manufacture of agricultural self-loading or self-unloading trailers or semi-trailers e) Manufacture of agricultural machinery for soil preparation, planting or fertilizing (e.g. Ploughs, manure spreaders, seeders, harrows, etc.) f) Manufacture of harvesting or threshing machinery (e.g. Harvesters, threshers, sorters, etc.)

CLASSIFICATION	CODE	DESCRIPTION
		<p>g) Manufacture of milking machines</p> <p>h) Manufacture of spraying machinery for agricultural use</p> <p>i) Manufacture of poultry-keeping machinery, bee-keeping machinery</p> <p>j) Manufacture of machines for cleaning, sorting or grading eggs, fruits, etc.</p> <p>k) Manufacture of other diverse agricultural machinery and equipment N.E.C.</p> <p>Excludes:</p> <p>a) manufacture of non-power-driven agricultural hand tools, see 2593</p> <p>b) manufacture of conveyors for farm use, see 2816</p> <p>c) manufacture of power-driven hand tools, see 2818</p> <p>d) manufacture of cream separators, see 2825</p> <p>e) manufacture of machinery to clean, sort or grade seed, grain or dried leguminous vegetables, see 2825</p> <p>f) manufacture of road tractors for semi-trailers, see 2910</p> <p>g) manufacture of road trailers or semi-trailers, see 2920</p>
CLASS	2822	Manufacture of metal-forming machinery and machine tools
ITEM	28220	Manufacture of metal-forming machinery and machine tools

CLASSIFICATION	CODE	DESCRIPTION
		<p>Includes:</p> <ul style="list-style-type: none"> a) Manufacture of punch presses, hydraulic presses, hydraulic brakes, drop hammers, forging machines, etc. b) Manufacture of draw-benches, thread rollers or machines for working wires c) Manufacture of stationary rotary or rotary percussion drills, filling machines, riveters, sheet metal cutters, etc. d) Manufacture of presses for the manufacture of particle board and the like e) Manufacture of other metal-forming machinery N.E.C. f) Manufacture of machine tools for working metals and other materials (e.g. Wood, bone, stone, hard rubber, hard plastics, cold glass, etc.), including those using a laser beam, ultrasonic waves, plasma arc, magnetic pulse, etc. g) Manufacture of machine tools for turning, drilling, milling, shaping, planning, boring, grinding, etc. h) Manufacture of stamping or pressing machine tools i) Manufacture of stationary machines for nailing, stapling, glueing or otherwise assembling wood, cork, bone, hard rubber or plastic, etc. j) Manufacture of electroplating machinery k) Manufacture of parts and accessories for the machine tools listed above (e.g. Work

CLASSIFICATION	CODE	DESCRIPTION
		<p>holders, dividing heads and other special attachments for machine tools)</p> <p>l) Manufacture of other machine tools N.E.C.</p> <p>Excludes:</p> <p>a) Manufacture of interchangeable tools for hand tools or machine tools (e.g. Drills, punches, dies, taps, milling cutters, turning tools, saw blades, cutting knives, etc.), see 2593</p> <p>b) Manufacture of electric hand held soldering irons and soldering guns, see 2790</p> <p>c) Manufacture of power-driven hand tools, see 2818</p> <p>d) Manufacture of machinery used in metal mills or foundries, see 2823</p> <p>e) Manufacture of machinery for mining and quarrying, see 2824</p>
CLASS	2823	Manufacture of machinery for metallurgy
ITEM	28230	<p>Manufacture of machinery for metallurgy</p> <p>Includes:</p> <p>a) manufactures of machines and equipment for handling hot metals: converters, ingot moulds, ladles, casting machines</p> <p>b) manufacture of metal-rolling mills and rolls for such mills</p> <p>Excludes:</p> <p>a) manufacture of draw-benches, see 2822</p>

CLASSIFICATION	CODE	DESCRIPTION
		<ul style="list-style-type: none"> b) manufacture of moulding boxes and moulds (except ingot moulds), see 2593 c) manufacture of machines for forming foundry moulds, see 2829
CLASS	2824	Manufacture of machinery for mining, quarrying and construction
ITEM	28240	Manufacture of machinery for mining, quarrying and construction Includes: <ul style="list-style-type: none"> a) Manufacture of continuous-action elevators and conveyors for underground use b) Manufacture of boring, cutting, sinking and tunnelling machinery (whether or not for underground use) c) Manufacture of machinery for treating minerals by screening, sorting, separating, washing, crushing, etc. d) Manufacture of concrete and mortar mixers e) Manufacture of earth-moving machinery (e.g. Bulldozers, angle dozers, graders, scrapers, levellers, mechanical shovels, shovels loaders, etc.) f) Manufacture of pile-drivers and pile-extractors, mortar spreaders, bitumen spreaders, concrete surfacing machinery, etc. g) Manufacture of track laying tractors and tractors used in constructions or mining h) Manufacture of bulldozer and angle-dozer blades

CLASSIFICATION	CODE	DESCRIPTION
		i) Manufacture of off-road dumping trucks j) Manufacture of machinery for mining, quarrying and construction n.e.c. Excludes: a) Manufacture of lifting and handling equipment, see 2816 b) Manufacture of other tractors, see 2821, 2910 c) Manufacture of machine tools for working stone, including machines for splitting or clearing stone, see 2822 d) Manufacture of concrete-mixer lorries, see 2910 e) Manufacture of mining locomotives and mining rail cars, see 3020
CLASS	2825	Manufacture of machinery for food, beverage and tobacco processing
ITEM	28250	Manufacture of machinery for food, beverage and tobacco processing Includes: a) Manufacture of agricultural dryers b) Cream separators c) Milk processing machinery (e.g. Homogenizers) d) Milk converting machinery (e.g. Butter chums, butter workers and moulding machines) e) Cheese-making machines

CLASSIFICATION	CODE	DESCRIPTION
		<p>f) Machinery to clean, sort or grade seeds, grain or dried leguminous vegetables</p> <p>g) Machinery to produce flour and meal etc. (e.g. Grinding mills, etc.)</p> <p>h) Manufacture of presses, crushers, etc. Used to make wine, cider, fruit juices, etc.</p> <p>i) Manufacture of machinery for the bakery industry or for making macaroni, spaghetti or similar products</p> <p>j) Machinery to make confectionery, cocoa or chocolate</p> <p>k) Machinery to manufacture sugar</p> <p>l) Machinery for breweries</p> <p>m) Machinery for process meat or poultry</p> <p>n) Machinery for prepare fruits, nuts or vegetables</p> <p>o) machinery for prepare fish, shellfish or other seafood</p> <p>p) Machinery for filtering and purifying</p> <p>q) Other machinery for the industrial preparation of manufacture of food or drink N.E.C.</p> <p>r) Manufacture of machinery for the extraction or preparation of animal fats or vegetable fats oils</p> <p>s) Manufacture of machinery for the preparation of tobacco and for the making of cigarettes or cigars or for pipe or chewing tobacco or snuff</p> <p>t) Manufacture of machinery for the preparation of food in hotels and restaurants</p>

CLASSIFICATION	CODE	DESCRIPTION
		Excludes: <ul style="list-style-type: none"> a) manufacture of food and milk irradiation equipment, see 2660 b) (b) manufacture of packing, wrapping and weighing machinery, see 2819 c) © manufacture of cleaning, sorting or grading machinery for eggs, fruit or other crops (except seeds, grains and dried leguminous vegetables), see 2821vegetables), see 2821
CLASS	2826	Manufacture of machinery for textile, apparel and leather production
ITEM	28260	Manufacture of machinery for textile, apparel and leather production <p>Includes:</p> <ul style="list-style-type: none"> a) Machines for preparing, producing, extruding, drawing, texturing or cutting man-made textile fibres, materials or yarns b) Machines for preparing textiles fibres (e.g. Cotton gins, bale breakers, garnetters, cotton spreaders, wool scouters, wool carbonizes, combs, carders, roving frames, etc.) c) Spinning machines d) Machines for preparing textiles yarns (e.g. Reelers, warpers and related machines) e) Weaving machines (looms), including hand looms f) Knitting machines

CLASSIFICATION	CODE	DESCRIPTION
		<p>g) Machines for making knotted net, tulle, lace, braid, etc.</p> <p>h) Manufacture of auxiliary machines or equipment for textile machinery (e.g. Dobbies, jacquards, spindles, spindle flyers, etc.)</p> <p>i) Manufacture of textile printing machinery</p> <p>j) Machinery for washing, bleaching, dyeing, dressing, finishing, coating or impregnating textile fabrics</p> <p>k) Manufacture of machines for reeling, unreeling, folding, cutting or pinking textile fabrics</p> <p>l) Ironing machines, including fusing presses</p> <p>m) Dry-cleaning machines</p> <p>n) Manufacture of sewing machines</p> <p>o) Manufacture of machines for producing or finishing felt or non-woven</p> <p>p) Machinery for preparing, tanning or working hides, skins or leather</p> <p>q) Machinery for making or repairing footwear or other articles of hides, skins, leather or fur skins</p> <p>Excludes:</p> <p>a) Manufacture of paper or paperboard cards for use on jacquard machines, see 1709</p> <p>b) Manufacture of domestic washing and drying machines, see 2750</p> <p>c) Manufacture of calendaring machines, see 2819</p>

CLASSIFICATION	CODE	DESCRIPTION
		d) Manufacture of machines used in bookbinding, see 2829
CLASS	2829	Manufacture of other special-purpose machinery
ITEM	28290	Manufacture of other special-purpose machinery n.e.c. Includes: <ul style="list-style-type: none"> a) Manufacture of machinery for making paper pulp b) Manufacture of paper and paperboard making machinery c) Manufacture of dryers for wood, paper pulp, paper or paperboard d) Manufacture of machinery producing articles of paper or paperboard e) Manufacture of machinery for working soft rubber or plastics or for the manufacture of products of these materials such as extruders, moulders, pneumatic tyre making or retreading machines and other machines for making a specific rubber or plastic product f) Manufacture of printing and bookbinding machines and machines for activities supporting printing on a variety of materials g) Machinery for producing tiles, bricks shaped ceramic pastes, pipes, graphite electrodes, blackboard chalk, foundry moulds, etc. h) Manufacture of semi-conductor manufacturing machinery

CLASSIFICATION	CODE	DESCRIPTION
		<p>i) Manufacture of diverse special-purpose machinery and equipment such as machines to assemble electric or electronic lamps, tubes (valves) or bulbs; machines for production or hot-working of glass or glassware, glass fibre or yarn machinery or apparatus for isotopic separation</p> <p>j) Manufacture of tire alignment and balancing equipment; balancing equipment (except wheel balancing)</p> <p>k) Manufacture of central greasing systems</p> <p>l) Manufacture of aircraft launching gear, aircraft carrier catapults and related equipment</p> <p>m) Manufacture of tanning beds</p> <p>n) Manufacture of automatic bowling alley equipment (e.g. Pin-setters)</p> <p>o) Manufacture of roundabouts, swings, shooting galleries and other fairground amusements</p> <p>Excludes:</p> <p>a) Manufacture of household appliances, see 2750</p> <p>b) Manufacture of photocopy machines, see 2817</p> <p>c) Manufacture of machinery or equipment to work hard rubber, hard plastics or cold glass, see 2822</p> <p>d) Manufacture of ingot moulds, see 2823</p>

2.3 Key Stakeholders

The key stakeholders for M&E industry in Malaysia comprise of government agencies, regulatory bodies, industry associations and professional bodies. Stakeholder defines as a person, group or organisation that has interest or concern in an organisation. Stakeholders can affect or be affected by the organisation's actions, objectives and policies.

2.3.1 Government Agencies and Regulatory Bodies

These are the Government Agencies that are empowered by the legislations according to the scope and powers given in the related acts that directly regulates the Machinery and Equipment Sector in Malaysia. Table 2.4 is the list of government agencies and regulatory bodies in M&E Industry.

Table 2.4: List of Government Agencies and Regulatory Bodies for M&E Industry

NO	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
1.	Malaysian Investment Development Authority (MIDA)	Incorporated as a statutory body under the Malaysian Industrial Development Authority (MIDA) Act, the establishment of MIDA in 1967 was hailed by the World Bank as “the necessary impetus for purposeful, positive and coordinated promotional action” for Malaysia’s industrial development. Today, MIDA’s is Malaysia’s cutting-edge, dynamic and pioneering force in opening pathways to new frontiers around the globe. MIDA assists companies which intend to invest in the manufacturing and services sectors, as well as facilitates the implementation of their projects. The wide range of services provided by MIDA include providing information on the opportunities for investments, as

NO	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
		well as facilitating companies which are looking for joint venture partners ⁷ .
2.	Ministry of Industry and International Trade (MITI)	<p>The Ministry of Commerce and Industry was established in April 1956 and situated in Government Office, Jalan Raja. The Ministry was then renamed the Ministry of Trade and Industry in February 1972. The Ministry of Industry and International Trade (MITI) is responsible to:</p> <ul style="list-style-type: none"> a) To plan, formulate and implement policies on industrial development, international trade and investment. b) To encourage foreign and domestic investment. c) To promote Malaysia's exports of manufacturing products and services by strengthening bilateral, multilateral and regional trade relations and cooperation. d) To enhance national productivity and competitiveness in the manufacturing sector. <p>MITI are also responsible for supervising MATRADE, MATRADE's mission is to promote Malaysia's export has enabled many local companies to carve new frontiers in global markets⁸.</p>

⁷ Malaysian Investment Development Authority (MIDA)(2019 27 August) retrieved from <https://www.mida.gov.my/home/about-mida/posts/>.

⁸ Ministry of Commerce and Industry (MITI) (2019, June 25). Retrieved from <https://www.miti.gov.my/index.php/pages/view/879>

NO	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
3.	Ministry of Human Resources (MoHR)	The Ministry of Human Resources, abbreviated MoHR, is a ministry of the Government of Malaysia that is responsible for skills development, labour, occupational safety and health, trade unions, industrial relations, industrial court, labour market information and analysis, social security ⁹ .
4.	Department of Occupational Safety and Health (DOSH)	A department under the Ministry of Human Resources. This department 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 arising from the activities from various sectors. As a government agency, the department is responsible for the administration and enforcement of legislations related to occupational safety and health of the country, with a vision of becoming an organisation which leads the nation in creating a safe and healthy work culture that contributes towards enhancing the quality of working life ¹⁰ .
5.	Department of Environment (DOE)	The main function of the DOE is to prevent, eliminate, control pollution and improve the environment, consistent with the purposes of the Environmental Quality Act 1974 and the regulations there under DOE is also responsible for the implementation of the resolutions decided by the conventions of the international environment such as Vienna Convention for the protection of the Ozone Layer 1985, Montreal Protocol on Substances That Deplete the Ozone Layer,

⁹ Ministry of Human Resources (MOHR) (2019, June 25). Retrieved from <https://www.mohr.gov.my/index.php/en>

¹⁰ DOSH (2019, August 27) retrieved from <http://www.dosh.gov.my/index.php/en/about-us/dosh-profile>

NO	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
		<p>1987, the Basel Convention on the Transboundary Movement of Hazardous Waste and Their Disposal Act 1989 and other areas while the success of programs of bilateral cooperation and multilateral cooperation between Indonesia, Singapore and other ASEAN countries on environmental management¹¹.</p>
6.	Royal Malaysian Customs Department (RMCD)	<p>RMCD plays a role in driving economic growth and safeguarding security country and people's well-being through three main functions as follows:</p> <ul style="list-style-type: none"> a) Collecting government revenue – collecting revenue from Import Duty, Export Duty, Excise Duty, GST (since April 2015), Windfall Profit Levy, Vehicle Levy, Non-Tax Revenue and State/Trust Fund Revenue. b) Providing facilitation to commercial & industrial sector – giving tax facility, tax exemption on raw materials and industrial machineries, export & import trades, tax reimbursement and customs facilities in line with current government's policy¹².
7.	SIRIM Berhad	<p>SIRIM Berhad, formerly known as the Standard and Industrial Research Institute of Malaysia (SIRIM), is a corporate organisation owned wholly by the Malaysian Government, under the Minister of Finance Incorporated. It has been entrusted by the Malaysian Government to be the national organisation for</p>

¹¹ DOE (2019, August 27) retrieved from <https://www.aecen.org/malaysia-department-environment>

¹² RMCD (2019, August 27) retrieved from <http://www.customs.gov.my/en/ci/>

NO	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
		standards and quality, and as a promoter of technological excellence in the Malaysian industry ¹³ .

2.3.2 Industry Associations and Professional Bodies

This section covers the activities of various industry associations and professional bodies related to the M&E industry. The scope of review covers professional services that are provided to the M&E industry. Regulations of these professional services will add value to the M&E industry and ultimately to the whole economy. Related industry associations and professional bodies are listed in Table 2.5.

Table 2.5: List of Related Industry Associations and Professional Bodies for M&E Industry

NO	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
1.	Manufacturing & Engineering Industries Federation (MEIF)	<p>MEIF was formed by industry members to coordinate, promote and spearhead the progressive development of Malaysia's machinery and engineering supporting industries to boost domestic consumption and become integrated into the global value chain. MEIF also trying to be the collective and cohesive voice of machinery and engineering supporting industries in Malaysia and facilitate international promotional activities of its members.</p> <p>a) Enhancing productivity and global competitiveness.</p> <p>b) Seminars, consultation guidance and information exchange about the industry.</p>

¹³ SIRIM (2019, August 27) retrieved from <http://www.sirim.my/about-us.html>

NO	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
		<p>c) Promotion of international trade, investment co-operation and joint-ventures.</p> <p>d) Investigation, research and compilation of information on domestic and global machinery and engineering supporting industries.</p> <p>e) Research and survey on development of machinery and engineering supporting industries.</p> <p>f) Protection of member's legal rights¹⁴.</p>
2.	Machinery and Equipment Manufacturers Association (MEMA)	<p>MEMA was formed under the name Heavy Equipment and Machinery Manufacturers Association of Malaysia (HEMMAM) to facilitate small and medium industries in similar sector to join MEMA membership. The objectives of MEMA are as follows:</p> <p>a) To promote cooperation among manufacturers of Machinery and Equipment in Malaysia.</p> <p>b) To promote development of machineries and equipment manufacturers through information dissemination, research and development and upgrade the level of technology of members.</p> <p>c) To serve as channel of communication between the Government and Members.</p> <p>d) To protect and promote commercial interest of its members.</p> <p>e) To promote the interest of the manufacturers in the ASEAN Region through the ASEAN Chambers of Commerce and Industry (ACCI).</p>

¹⁴ MEIF (2019, August 27) retrieved from www.meif.org.my

NO	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
		<p>f) To promote industrial linkages programme in cooperation with small and medium scale industries.</p> <p>g) To promote skills and awareness programme in the education system.</p> <p>h) To promote the interest and product of members to the international market¹⁵.</p>
3.	Malaysia Special Tooling and Machining Association (MSTMA)	<p>Established on August 1, 1994 as Selangor and Federal Territory Mould and Die Association. However, on September 21, 2001 the association was nationalized and the name was changed to Malaysia Special Tooling and Machining Association (MSTMA).</p> <p>The objective of the establishment is to promote and protect the general interest of all its members by providing the means of mutual co-operation in exchanging and exploiting technical knowledge and business development in and out of Malaysia.</p> <p>a) To promote technical research and facilitate development in respect to the mould and die industry.</p> <p>b) To organize activities and seminars in relation to the mould and die industry.</p> <p>c) To act as a center for submission and collection of mould and die information.</p> <p>d) To communicate and establish links between internal and foreign mould and die organizations. Currently also a member of Federation of Asian</p>

¹⁵ MEMA (2019, August 27) retrieved from www.mema.org.my › about us

NO	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
		Die and Mould Association (FADMA) consisting of 11 countries member associations ¹⁶ .

2.3.3 Training Centre

The M&E sector is a subset of the manufacturing industry. There are no training centers that carry out specific programs for employment within the M&E sector. Academic institutes and skills training centers offering programs such as mechanical, electronic, electrical, mechatronic are the major contributors to producing workers in this field. Among the training centres that offers various programs related to M&E industry are as at Table 2.6.

Table 2.6: List of Training Centre for M&E Industry

NO	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
1.	Institut Latihan Perindustrian (ILP)	The Institut Latihan Perindustrian (ILP) is a training institute for the production of skilled labour to meet the demands of the industrial sector in Malaysia. ILP is manage by the Department of Human Resources has been producing national talent from the training certificate level to the Advanced Diploma in various skill courses.
2.	Institut Kemahiran Belia Negara (IKBN)	The Institut Kemahiran Belia Negara (IKBN) and the Institut Kemahiran Tinggi Belia Negara (IKTBN) are a skill-based institution housed under the Ministry of Youth and Sports Malaysia.

¹⁶ MSTMA (2019, August 27) retrieved from <http://www.mmada.org.my/>

NO	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
		<p>Among the courses taught are industrial electronics, video audio and computer technology. These training courses typically take between 18 months and 36 months depending on the area of expertise. Successful trainees will receive MSC certificate from DSD.</p>
3.	<p>Technical and Vocational Education and Training (TVET) MARA</p>	<p>MARA Technical and Vocational Division is accountable for developing and maintaining TVET educational programmes that prepare students for occupations important to Malaysia's economic development. These programmes are categorised into 12 different clusters and are geared towards the students of the institutions under its purview which are Kolej Kemahiran Tinggi MARA, MARA-Japan Industrial Institute and Institusi Kemahiran MARA throughout the country. With the support of partners in education and industry, each programme includes the academic and technical skills required to be successful in today's economy. Students who have completed their studies from these institutions may be able to launch their careers in a completely new direction by furthering their studies locally or abroad¹⁷.</p>
4.	<p>GIATMARA</p>	<p>The establishment of GIATMARA aims to provide technical and vocational skills training to youths in rural areas and in towns to enable them in acquiring skills as preparation to become skilled work force and technical entrepreneurs in meeting the needs of the industry and</p>

¹⁷ TVET MARA (2019, August 27) retrieved from <http://www.tvetmara.edu.my/en/index.php/information-on-kktm-mjii-ikm>

NO	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
		needs of economic development as well as entrepreneurship within local areas and in the country ¹⁸ .
5.	Centre for Instructor and Advanced Skill Training (CIAST)	<p>Centre for Instructor and Advanced Skill Training situated in Shah Alam, Selangor. CIAST has started operations in the year 1983 with the financial help from Government of Japan under ASEAN Human Resource Development Project and supervised by management and technical experts from Japan through JICA until 1991.</p> <p>CIAST has been fully operational under Manpower Department, Ministry of Human Resources beginning in 1991 until May 2007 before CIAST management is been transferred to under Department of Skills Development (DSD) in the same ministry in June 2007¹⁹.</p> <ul style="list-style-type: none"> a) Industrial Automation in TVET Training (Basic). b) Industrial Automation in TVET Training (Intermediate). c) Application and Development of PLC System (Electrical/Electronic). d) Industrial Electrical Wiring & AC Motor Control Technology. e) Mechanical & Electrical Service Maintenance. f) Machinery & Equipment Maintenance.

¹⁸ GIATMARA (2019, August 27) retrieved from <http://giatmara.edu.my>

¹⁹ CIAST (2019, August 27) retrieved from <https://www.ciaast.gov.my/?p=735&lang=en>

2.4 Government Legislations, Policies and Initiatives

Below are the related legislations, by-laws and policies that are directly related to M&E industry.

2.4.1 Government Legislations

The following legislations are relevant to the M&E industry shown at Table 2.7;

Table 2.7: List of Government Legislation Related to M&E Industry

NO	LEGISLATIONS	ENFORCEMENT AGENCIES	DESCRIPTION
1.	Factories and Machinery Act 1967 (Revised 1974)	Department of Occupational Safety and Health (DoSH)	An Act to provide for the control of factories with respect to matters relating to the safety, health and welfare of person therein, the registration and inspection of machinery and for matters connected therewith ²⁰ .
2.	Occupational Safety and Health Act 1994		This Act is for securing the safety, health and welfare of persons at work, for protecting others against risks to safety or health in connection with the activities of persons at work ²¹ .
3.	Promotion of Investments Act 1986	Ministry of	These Acts cover investments in the manufacturing, agriculture, tourism (including hotel) and

²⁰ Factory and Machinery act 1967 (2019, August 25) retrieved from <http://www.dosh.gov.my/index.php/en/legislation/regulations-1/regulations-under-factories-and-machinery-act-1967-act-139>

²¹ OSHA 1994 (2019, August 25) retrieved from <http://www.dosh.gov.my/index.php/en/legislation/regulations-1/osh-1994-act-154>

NO	LEGISLATIONS	ENFORCEMENT AGENCIES	DESCRIPTION
		International Trade and Industry (MITI)	approved services sectors as well as R&D, training and environmental protection activities. The direct tax incentives grant partial or total relief from income tax payment for a specified period, while indirect tax incentives are in the form of exemptions from import duty, sales tax and excise duty ²² .
4.	Trade Act of 2011		An Act for the purpose of promoting good trade practices by prohibiting false trade descriptions and false or misleading statements, conduct and practices in relation to the supply of goods and services and to provide for matters connected therewith or incidental thereto ²³ .
4.	Industrial Coordination Act 1975	Malaysian Investment Development Authority (MIDA)	An Act to provide for the co-ordination and orderly development of manufacturing activities in Malaysia, for the establishment of an Industrial Advisory Council and for other

²² Promotion of Investments Act 1986 (2019, August 25) retrieved from

<http://www.agc.gov.my/agcportal/uploads/files/Publications/LOM/EN/Act%20327.pdf>

²³ Trade Act of 2011. (30 June, 2019) Retrieved from <https://www.inta.org/INTABulletin/Pages/MALAYSIA-New-Trade-Descriptions-Act.aspx>

NO	LEGISLATIONS	ENFORCEMENT AGENCIES	DESCRIPTION
			matters connected therewith or incidental thereto ²⁴ .
5.	Environmental Quality Act 1974	Department of Environment (DoE)	This Act is for the prevention, abatement, control of pollution and enhancement of the environment, and for purposes connected therewith ²⁵ .
6.	Employment Act 1955	Ministry of Human Resources (MoHR)	Scope of the Act (First Schedule of the Employment Act): The definition of "employee" covered under the scope of the Employment Act is as follows ²⁶ : a) Based on wages, regardless of nature of work i.e., employees earning RM2,000 and below; or b) Based on the nature of work, regardless of wages i.e., employees engaged in manual labour or employees supervising those engaged in manual labour in and throughout the performance of their work. Drivers and other employees who are involved

²⁴ Industrial Coordination Act 1975. (30 June, 2019) Retrieved from https://grp.miti.gov.my/miti-grp/resources/Public%20Consultation/Industrial_Coordination_Act_1975_-_Act_156.pdf

²⁵ Environmental Quality Act 1974. (30 June, 2019) Retrieved from <http://www.agc.gov.my/agcportal/uploads/files/Publications/LOM/EN/Act%20127.pdf>

²⁶ National Human Resource Centre (NHRC). (29 June, 2019). Retrieved from <http://www.nhrc.com.my/employment-act-1955#.XSLIoDjVK00>

NO	LEGISLATIONS	ENFORCEMENT AGENCIES	DESCRIPTION
			in the operation and maintenance of motorised vehicles and irrespective of the wages they earn in a month ²⁷ .
7.	Industry Relation Act (Act 1967)		An Act to promote and maintain industrial harmony and to provide for the regulation of the relations between employers and workmen and their trade unions and the prevention and settlement of any differences or disputes arising from their relationship and generally to deal with trade disputes and matters arising therefrom ²⁸ .

2.4.2 Government Policies and Initiatives

The Government has identified the M&E industry to be one of the key areas for growth and development. The growth will focus on the manufacture of high value-added and high technology M&E.

This industry is categorised into the following classifications:

- a) Power generating M&E.

²⁷ Employment Act 1955. (30 June, 2019) Retrieved from <http://www.agc.gov.my/agcportal/uploads/files/Publications/LOM/EN/Act%20265%20-%20Employment%20Act%201955.pdf>

²⁸ Industry Relation Act (Act 1967). (30 September, 2019) Retrieved from <https://www.ilo.org/dyn/natlex/docs/ELECTRONIC/48066/99440/F1841123767/MYS48066.pdf>

- b) Metalworking machinery.
- c) Specialised process machinery or equipment for specific industry.
- d) General industrial M&E, components and parts²⁹.

For the further development of the M&E industry, six strategic thrusts have been set during the Third Industrial Master Plan (IMP3), 2006 - 2020 period:

- a) Promoting Malaysia as a regional production, trading and distribution centre for machinery and equipment
- b) Intensifying the development and promotion of selected specialised and high technology machinery and equipment
- c) Strengthening the engineering support industries and support services
- d) Developing Malaysian Standards for machinery and equipment
- e) Developing sufficient highly skilled workforce
- f) Strengthening the institutional support for the further development of the industry³⁰.

To enhance growth and encourage investments in the M&E sector, the Government offers the following:

- a) Automation Capital Allowance (ACA)

The Automation Capital Allowance [Accelerated Capital Allowance (ACA) of 100% + Automation Equipment Allowance (AE) of 100%] was introduced to encourage swift adoption of automation among manufacturing companies in undertaking innovative and productive activities. It is divided into two (2) categories, namely;

- i) For high labour-intensive industries (rubber products, plastics, wood, furniture and textiles), an Automation CA of 200% will be provided on the first RM4 million expenditure incurred within YA 2015 to 2020;

²⁹ Ministry of International Trade and Industry (MITI). (2018, March 15). Retrieved from http://www.miti.gov.my/miti/resources/7._Machinery_and_Equipment_Industry_.pdf

³⁰ Unit Perancang Ekonomi. (2018, March 15). Retrieved from <http://epu.gov.my/en/rmk/eleventhmalaysia-plan-2016-2020>

- ii) For other industries, an Automation CA of 200% will be provided on the first RM2 million expenditure incurred within YA 2015 to 2020.

b) Digital Transformation Acceleration Program (DTAP)

The Malaysia Digital Economy Corporation Sdn Bhd (MDEC) launched the “Digital Transformation Acceleration Program (DTAP)” on 9 April 2018. DTAP was envisioned to future proof Malaysian companies by providing a structured approach to digital adoption to enable companies to remain competitive. The objectives of digitising companies are to enhance their global competitiveness, strengthen growth and productivity of manufacturing industries, create high value-added jobs and reduce dependency on foreign labour, as well as to increase the prowess of SMEs. DTAP is a partnership between MDEC and MIDA, which provides a matching grant to companies that qualify for the program.

DTAP is a structured approach which allows companies identify pain points and exploits opportunities in digital, and develop potential solutions through lab sessions to design, develop and create proof of concepts. These proofs of concepts are measurable, and outcome based.

c) Domestic Investment Strategic Fund (DISF)

Establishment of a Domestic Investment Strategic Fund of RM1 billion to accelerate the shift of Malaysian-owned companies in targeted industries to high value-added, high technology, knowledge-intensive and innovation-based industries. The package of assistance will be granted under the Customised Incentive Scheme, based on the request of the companies and the merits of each case. The Fund aims to harness and leverage on outsourcing opportunities created by Multinational corporations (MNCs) operating in Malaysia; intensify technology acquisition by Malaysian-owned companies; and enable Malaysian-owned companies to obtain international standards/certifications in strategic industries. The Fund does not offer an outright grant and is contingent on the investments of the applicant.

d) Tax incentives

Pioneer Status with tax exemption of 70% to 100% of statutory income for a period of 5 to 10 years, or Investment Tax Allowance of 60% to 100% on qualifying capital expenditure incurred within a period of 5 years. This allowance can be offset against 70% to 100% of the statutory income for each year of assessment.

e) Reinvestment Allowance

Reinvestment Allowance of 60% on qualifying capital expenditure for 15 years.

f) Import duty

Import duty exemption for machinery and equipment; spare parts and consumables; and raw materials and components.

2.5 Industry and Market Intelligence

Industry and market intelligence are the collection and analysis of data of an industry by various sources of data to be utilise by the industry to make business decisions, manpower developments and training requirements. Industry intelligence is critical for developing strategies in the development of the industry, areas of manpower development and the impact of those developments. This section will provide information regarding manufacture of machinery and equipment industry based on the industry growth and employment statistics.

2.5.1 Growth of Manufacture of Machinery & Equipment Industry

Based on National Account Gross Domestic Product 2015-2018, Malaysia gross domestic product (GDP) recorded RM1,446.9 billion in 2018, which see 4.7 per cent growth compared to 2017 with 5.7 per cent³¹. For main contributor in Malaysia GDP 2018, services and manufacturing are the main contributor with 56.7 per cent and 22.4 per cent

³¹ Department of Statistics Malaysia. 2019. National Account Gross Domestic Product 2018. Page 1

respectively. Meanwhile, private final consumption was the main influencer for main expenditure.

Other than that, for this research, it will focus on manufacture of machinery and equipment industry in manufacturing sector. For manufacturing sector percentage share to Malaysia GDP, it is recorded 22.4 per cent contribution to Malaysia GDP in 2018 compared to 22.3 per cent in 2017, 22.3 per cent in 2016 and 22.3 per cent in 2015³². From the percentage share, it can be seen that, in 2018, manufacturing sector recorded a slight increase in percentage share to Malaysia GDP as compared to 2017. More than that, manufacture of machinery and equipment contributed 0.7 per cent for percentage share to Malaysia GDP in 2016 to 2018.

In terms of annual percentage change of manufacture of machinery and equipment industry in 2018, it is slightly increasing to 5.3 per cent as compared to 5.2 per cent in 2017³³.

2.5.2 Employment Statistics

This section provides an overview regarding labour force, labour demand in Malaysia and employment statistics of manufacturing sector.

a) Labour Force in Malaysia

Labour force can be defined as the sum of persons in employment and persons in unemployment. Together these two groups of the population represent the current supply of labour for the production of goods and services taking place in a country through market transactions in exchange for remuneration³⁴. The concept and definition of labour force in Malaysia are stated in Figure 2.1 below.

³² Department of Statistics Malaysia. 2019. National Account Gross Domestic Product 2018. Page 42

³³ Department of Statistics Malaysia. 2019. National Account Gross Domestic Product 2018. Page 38

³⁴ International Labour Organization. 2018. Labour force (2019, 30 September) Retrieved from [https://www.ilo.org/global/statistics-and-databases/statistics-overview-and-topics/WCMS_470304/lang--en/index.htm](https://www.ilo.org/global/statistics-and-databases/statistics-overview-and-topics/WCMS_470304/lang-en/index.htm)

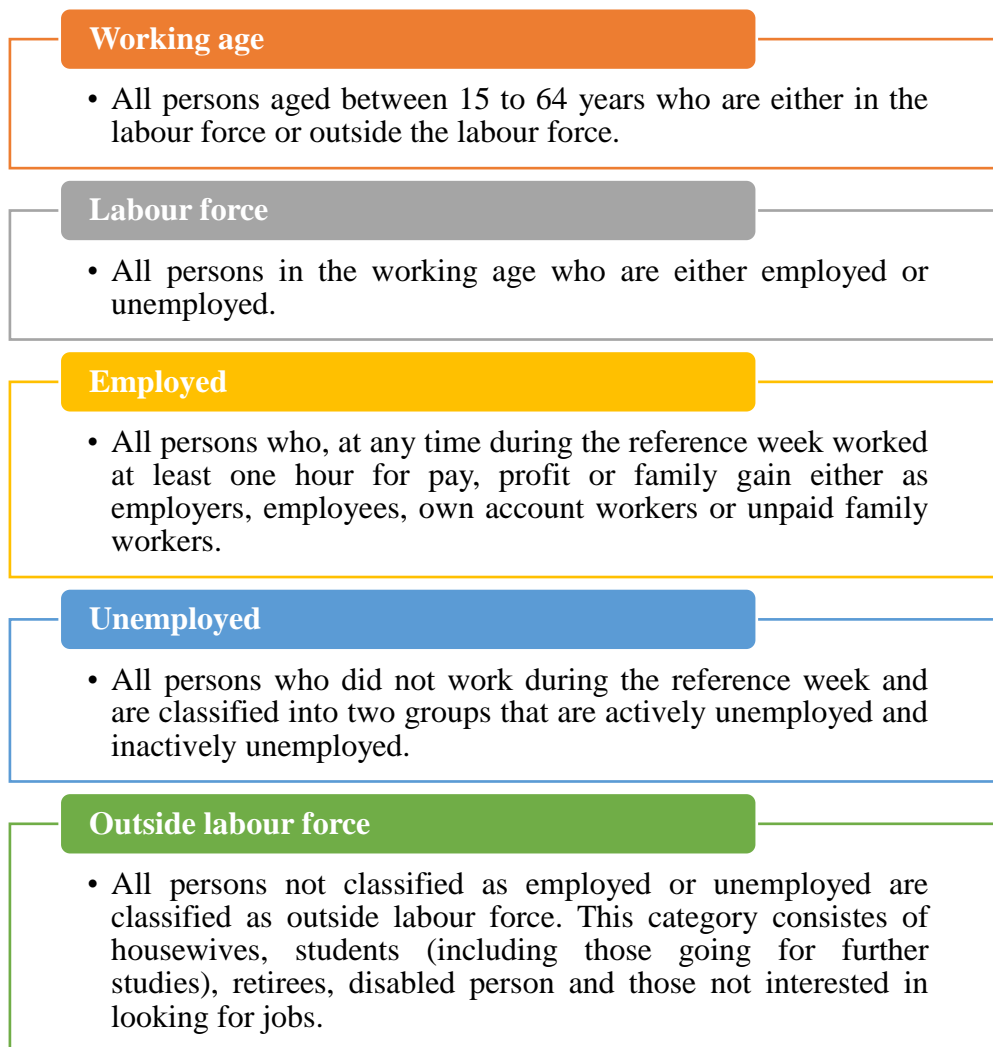


Figure 2.1: Concept and definition of labour force in Malaysia

Labour force in Malaysia increased by 2.0 per cent from 15.0 million persons in 2017 to nearly 15.3 million persons in 2018. The increment in labour force was contributed by 299,200 employed persons. Labour force participation rate (LFPR) in 2018 increased by 0.3 percentage points to 68.3 per cent as compared to 68.0 per cent in 2017³⁵. Hence, the remaining 31.7 per cent of the working age population was outside the labour force. On the other hand, the unemployment rate improved to 3.3 per cent in 2018 as compared to 3.4 percent in 2017. This shows that the country's economy is still operating with full employment where the unemployment rate is below 4.0 per cent.

³⁵ Department of Statistics Malaysia. 2019. The Labour Force Survey Report 2018. Page 12

b) Overview of manufacturing sector labour demand

Labour demand indicates the total labour that the economy is willing to employ at any given point of time. At the microeconomic level, labour demand by firm refers to positions in the company; and through the process of hires and separations, the information of filled positions and vacancies can be estimated. The concepts and definitions of the statistics on labour demand in this publication are as in Figure 2.2.

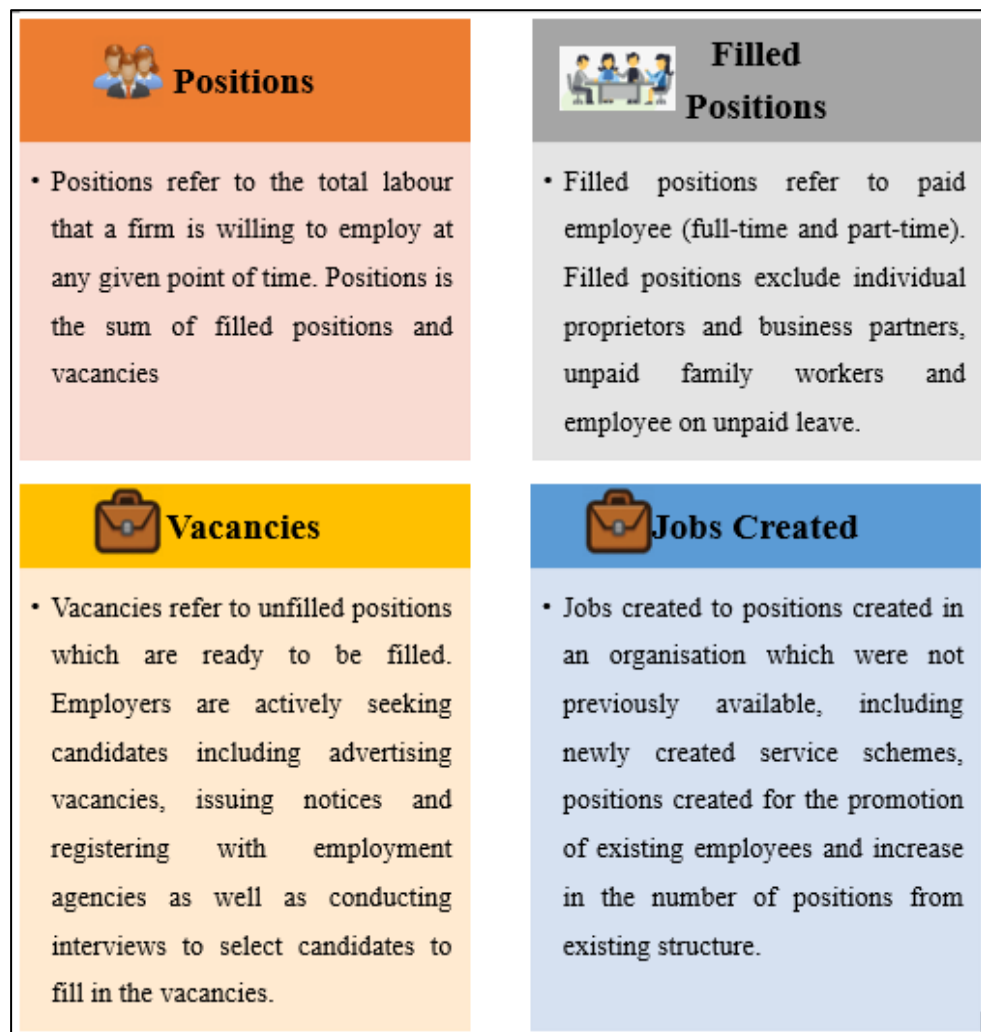


Figure 2.2: Concepts and definitions of the statistics on labour demand

(Source: Department of Statistics Malaysia, 2019)

In second quartile of 2019, manufacturing sector posted 2,270 thousand positions, increase 51 thousand as against 2,219 thousand in second quartile of 2018. During this quarter, the rate of filled positions for this sector was 94.7 per cent while vacancies rate was 5.3 per cent. The number of filled positions increased to 2,148 thousand (Q2 2018: 2,111 thousand) while vacancies in this sector was 121 thousand. Meanwhile, there were 6 thousand jobs created in the Manufacturing sector in Q2 2019³⁶. The detailed information can be referred in Figure 2.3.

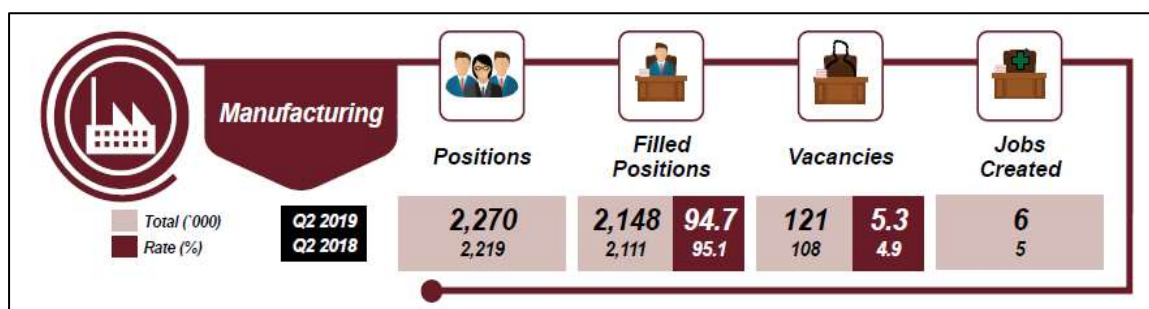


Figure 2.3: Employment statistics in manufacturing sector

The percentage share for position by skill recorded 73.9 per cent for semi-skilled worker, 18.8 per cent for skilled worker and 7.3 per cent for low skilled worker³⁷. As compared to 2017, semi-skilled worker comprised of 73.8 per cent followed by skilled worker and low skilled worker with 18.9 per cent and 7.3 per cent respectively. The details of the information can be referred to Figure 2.4.

³⁶ Department of Statistics Malaysia. 2019. Employment Statistics Second Quarter 2019. Page 14

³⁷ Department of Statistics Malaysia. 2019. Employment Statistics Second Quarter 2019. Page 33

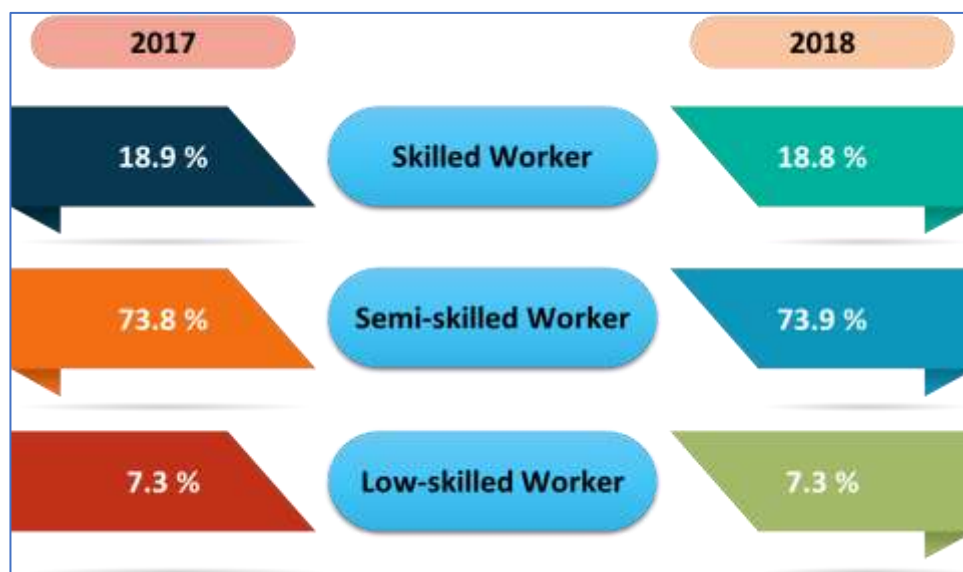


Figure 2.4: Position by skill in manufacturing sector by percentage share
(Source: Department of Statistics Malaysia, 2019)

Other than that, the percentage share for filled position by skill in manufacturing sector in 2018, 74.7 per cent was recorded for semi-skilled worker, 18.6 per cent for skilled worker and 6.7 per cent for low skilled worker³⁸. The comparison with 2017 can be referred to Figure 2.5.

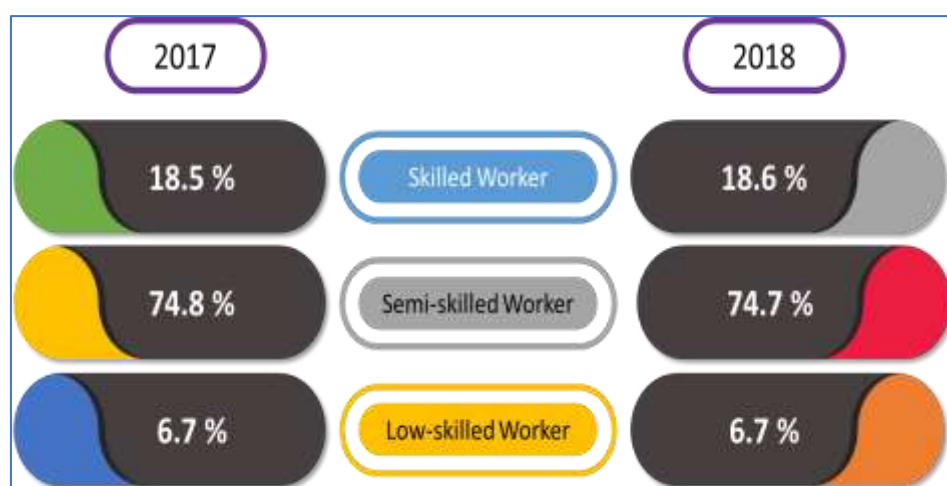


Figure 2.5: Filled position by skill in manufacturing sector
by percentage share
(Source: Department of Statistics Malaysia, 2019)

³⁸ Department of Statistics Malaysia. 2019. Employment Statistics Second Quarter 2019. Page 39

The vacancies by skill in manufacturing sector by percentage share for 2018, 59.2 per cent was recorded for semi-skilled worker, 23.2 per cent for skilled worker and 17.6 per cent for low skilled worker³⁹. The comparison with 2017 can be referred to Figure 2.6.



Figure 2.6: Vacancies by skill in manufacturing sector by percentage share
(Source: Department of Statistics Malaysia, 2019)

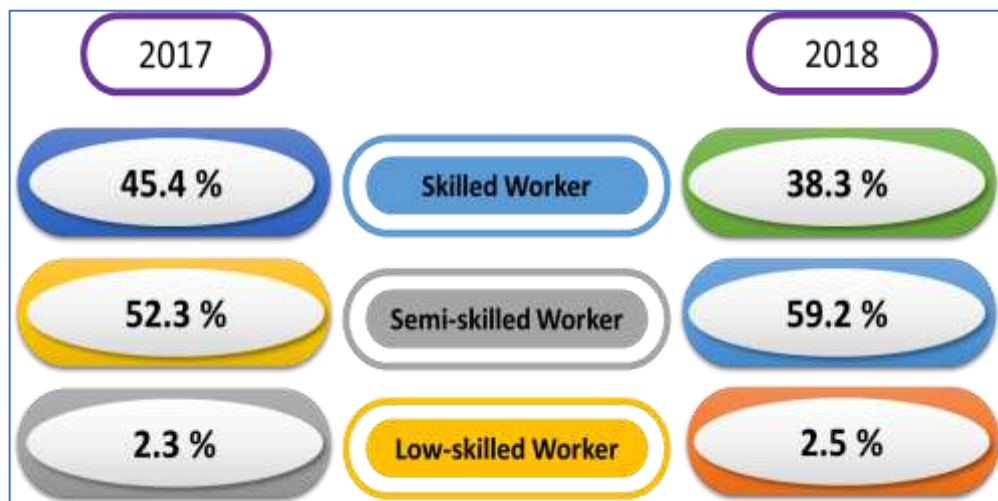


Figure 2.7: Jobs created by skill in manufacturing sector by percentage share
(Source: Department of Statistics Malaysia, 2019)

The jobs created by skill in manufacturing sector by percentage share for 2018, 59.2 per cent was recorded for semi-skilled worker, 38.3 per cent

³⁹ Department of Statistics Malaysia. 2019. Employment Statistics Second Quarter 2019. Page 45

for skilled worker and 2.5 per cent for low skilled worker⁴⁰. The comparison with 2017 can be referred Figure 2.7.

c) Employment growth of manufacturing of M&E industry

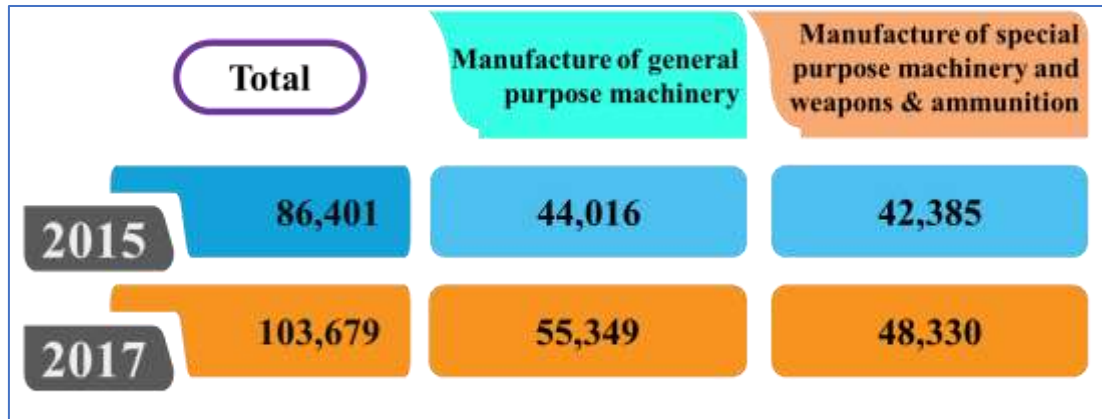


Figure 2.8: Number of Persons Engaged for Manufacturing of Machinery and Equipment N.E.C. by sub-sector, 2015 and 2017, Malaysia
(Source: Department of Statistics Malaysia, 2018)

Figure 2.8 shows the Number of Persons Engaged by sub-sector for 2015 and 2017 where it can be seen here that the highest number of persons engaged came from manufacture of general-purpose machinery sub-sector with 55,349 persons (2015: 44,016). The manufacture of special purpose machinery and weapons & ammunition sub-sector with 48,330 persons (2015: 42,385)⁴¹.

2.5.3 Conclusion

In conclusion, for manufacture of M&E industry, from 2015-2018, the contribution of this industry toward Malaysia GDP are growth at 0.7 per cent. More than that, for employment statistics, number of persons engaged with the manufacture of machinery and equipment industry increased to 103,679 persons in 2017 compare to 86,401 persons in 2015.

⁴⁰ Department of Statistics Malaysia. 2019. Employment Statistics Second Quarter 2019. Page 51

⁴¹ Department of Statistic Malaysia (DOSM). (2018). Annual Economic Statistic 2018

The growth of this industry clearly shows that manufacture of machinery and equipment industry is one of potential industry for enhance country development in the future.

2.6 Existing NOSS Relevant to MSIC 2008 Section C, Division 28

The DSD has developed eight (8) NOSS related to Division 28, as of January 2019. The details of the existing NOSS title relevant to the M&E industry according to NOSS Registry January 2019 provided in the table 2.8 below.

Table 2.8: Summary of NOSS Developed under the Division 28

(Source: NOSS Registry January 2019)

MSIC GROUP	CORRESPONDING NOSS/ LEVEL
C281 Manufacture of general-purpose machinery	1) EE-212-3:2013 Solar Panel Manufacturing Operation (Thin Film Modul) 2) EE-213-3:2014 Solar PV System Installation & Maintenance 3) EE-212-4:2013 Solar Panel Manufacturing Control 4) EE-213-4:2014 Solar PV System Design & Optimization 5) EE-212-5:2013 Solar Panel Manufacturing Management 6) EE-213-5:2014 Solar PV System Management
C282 Manufacture of special-purpose machinery	1) C282-002-3:2019 Aircraft Component and Structure Assembly 2) C282-002-3:2019 Aircraft Component and Structure Assembly

2.7 Overview of Machinery and Equipment Industry in Developed Countries

Machinery and equipment industry is an important industries. Even in developed countries Machinery and equipment industry is an important industry which act as a major contributor to the economy and provide jobs to millions of people. Two countries are selected as overview for the M&E industry which are United States of America, Germany and China. Machinery manufacturing is one of the largest and most competitive sectors of the U.S. manufacturing economy. Exports of capital equipment totalled \$141 billion in 2018 alone. Whereas, machinery and equipment industry in Germany is the second largest and most innovative sector in Germany. It is one of the technological motors that drive the country as a high-tech nation, and one which combine s all the key feature technologies including electronics, robotics, materials and software. Besides that, machinery industry in China is one of the leading pillars of the country's economy. Its main business revenue increased about 6.05% in 2018, reaching \$3.18 trillion in value. The complete comparison between these countries are listed in Chapter 4.

2.8 Relation of Industry and Industrial Revolution 4.0 (IR4.0)

The global manufacturing sector is heading towards a major facelift as manufacturing is increasingly shifting towards more technologically complex processes. Technologies such as big data, improved data analytics, machine-to-machine communication, advanced robotics and 3D printing are currently transforming the fundamentals of production.

The new face, being termed as IR4.0 connects systems intelligently within the entire value chain and support activities of manufacturing. Every process is digitised in all sectors where companies integrate all aspects of manufacturing to technology, thereby improving the entire value chain⁴².

Based on MITI definition, the IR4.0 is an overarching industrial transformation that covers every aspect of industries and economic activities including every aspect of living. It is a total transformation of all sectors into new system and/or way of life that will

42 Tutorialspoint (June 2019). Industry 4.0: The Changing Face of Manufacturing. Retrieved from <https://www.tutorialspoint.com/articles/industry-4-0-the-changing-face-of-manufacturing>

change the way we do businesses. Current technological advances at times also considered as ‘disruptive technologies’ due to the convergence of the physical, digital and biological worlds. IR4.0 is referred to as production or manufacturing based industries digitalisation transformation, driven by connected technologies. IR4.0 introduces what is referred to as “smart factory” in which cyber physical systems monitor real time physical progress of the factory and are able to make decentralized decisions. Other terminology includes Smart Manufacturing. Some regard IR4.0 as a subset of the Fourth Industrial Revolution⁴³.

2.8.1 Industry4WRD – Manufacturing’s Next Act

Launched on 31 October 2018, Industry4WRD is Malaysia’s national policy on Industry 4.0 (I4.0), which calls for a smarter and stronger manufacturing sector driven by people, processes, and technology. It is a pivotal step towards Malaysia becoming a developed nation that is equitable, sustainable, and inclusive over the next few years. Industry4WRD is a collaborative effort between the Government, industry, and academia, aiming for enhanced productivity, greater job creation, and the creation of a high-skilled talent pool in the manufacturing sector. Further, it encourages the development of the sector’s innovative capacity and capability to create Malaysia’s own technologies, products, and services. The Government will act as an enabler in the overall digital transformation of companies in the manufacturing sector and related services, particularly the small and medium enterprises (SMEs)⁴⁴ as shown at Figure 2.9.

The primary aims of Industry4WRD is summarised below:

- a) Attract stakeholders to IR4.0 technologies and processes;
- b) Create the right ecosystem for IR4.0 technologies to be adopted and to nurture innovations; and
- c) Transform capabilities of the manufacturing industries to be IR4.0-ready in a holistic and accelerated manner.

43 MITI (June 2019). INDUSTRY 4.0 Retrieved from <https://grp.miti.gov.my>

44 Malaysian Investment Development Authority (March 2019) Malaysian Investment Performance 2018. Retrieved from <https://www.mida.gov.my/home/malaysia:-investment-performance/posts/>

Below are the Figure 2.9: Industry4WRD for Manufacturing sector;

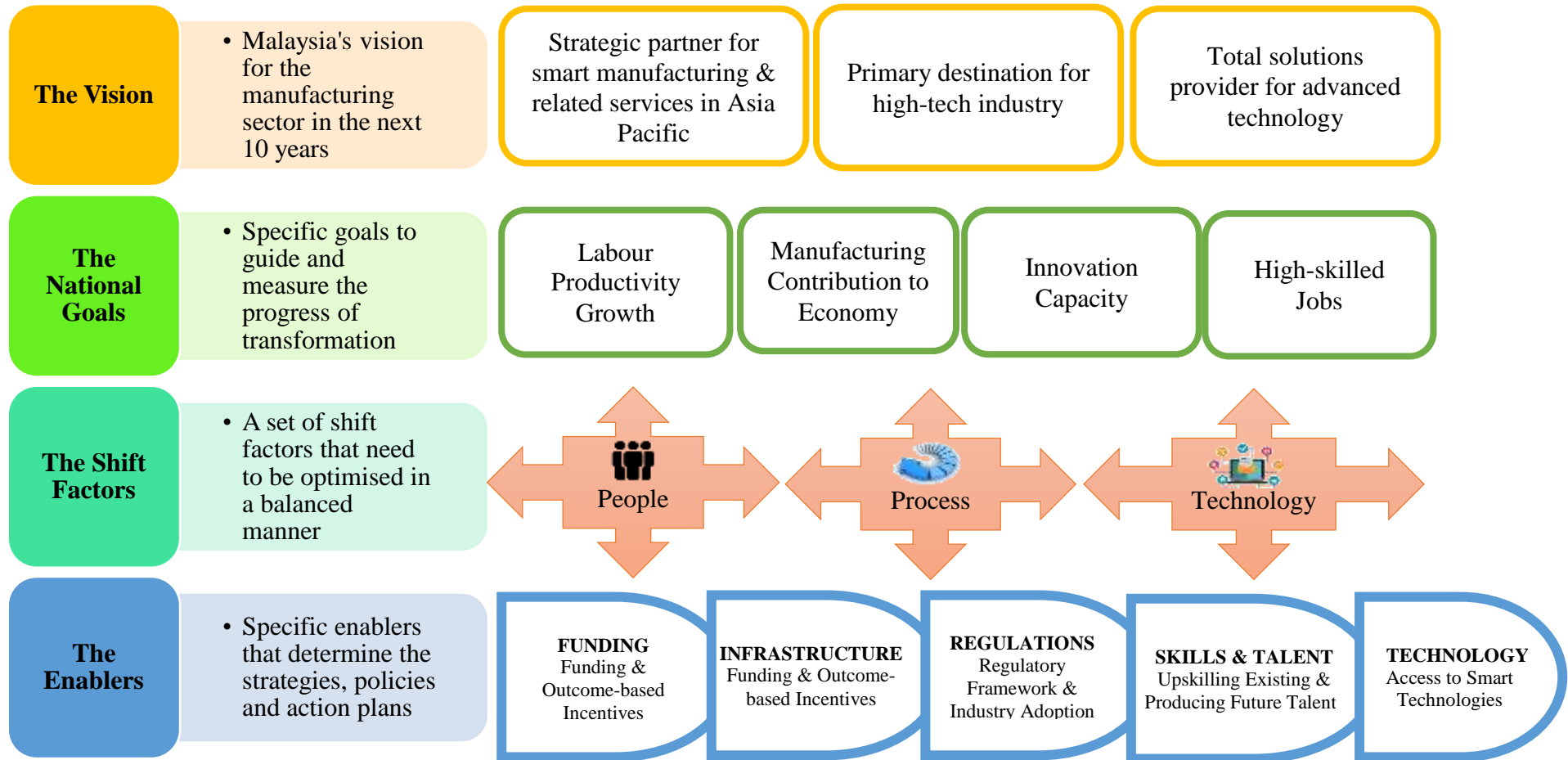


Figure 2.9: Industry4WRD for Manufacturing Sector

(Source: <https://www.miti.gov.my/index.php/pages/view/4832>)

The Government has also developed an Industry4WRD Readiness Assessment Programme to enable businesses to assess where they are, the current gaps existing in their manufacturing lines, and the way forward into IR4.0, through the targeted intervention of experienced assessors. As a clear strategic direction for the nation, Industry4WRD marks the starting point for Malaysia to fully embrace IR4.0, with smart manufacturing eventually leading to the emergence of smart cities, smart grids, and smart services. With this policy in place, the Government anticipates that by 2025, Malaysia will be one of the primary destinations for high-tech industries and ranked among the top 30 nations in the Global Innovation Index⁴⁵.

The four overarching national goals:

- i) Drive continuous growth in manufacturing GDP;
- ii) Increase national productivity;
- iii) Create high skill employment opportunities; and
- iv) Raise innovation capabilities and competitiveness.

The five Strategic Enablers (F.I.R.S.T.) for the digital transformation of companies (particularly SMEs) in the manufacturing and related-services sectors⁴⁶:

- i) Providing funding and outcome-based incentives
 - Encourage investments in the introduction and adoption of Industry 4.0 technologies and processes, followed by dynamic and innovative financial products.
- ii) Creating enabling ecosystems and efficient digital infrastructure
 - Strengthen digital connectivity in and between industrial, educational, and training hubs; while enhancing the digitalisation and integration of Government processes along supply and manufacturing value chains.
 - Link Industry 4.0 service providers to manufacturing firms in order to help implement technology, process, and skill development.

45 Malaysian Investment Development Authority (March 2019) Malaysian Investment Performance 2018. Retrieved from <https://www.mida.gov.my/home/malaysia:-investment-performance/posts/>

46 Malaysian Investment Development Authority (March 2019) Malaysian Investment Performance 2018. Retrieved from <https://www.mida.gov.my/home/malaysia:-investment-performance/posts/>

iii) Ensuring regulatory framework and industry adoption

- Increase awareness of the opportunities provided by Industry 4.0 technologies and processes among manufacturing firms.
- Create a platform to help such firms, especially SMEs, assess and develop their Industry 4.0 capabilities.
- Improve data integrity, standards, sharing, and security capabilities to facilitate seamless integration of manufacturing value chains and support intra-ministerial coordination for effective Industry 4.0 programmes.

iv) Upskilling existing and ensuring future talent is produced

- Design national development programmes for manufacturing sectors to ensure the availability of future talent by equipping students with the necessary Industry 4.0 skill sets.

v) Providing access to smart technologies

- Establish digital/technology labs and collaborative platforms through public-private partnerships (PPPs) to foster the adoption of new technologies and facilitate the transfer of knowledge.
- Intensify Research, Innovation, Commercialisation and Entrepreneurship programmes to support advanced priority sectors.

2.9 Conclusion

The Machinery & Equipment sector is an important and strategic part of Malaysian manufacturing industry. There are eight (8) NOSS related to this division have been developed over the years. Certain NOSS titles in this group have not been revised and require immediate action to update the standard.

The findings on industry landscape, MSIC definition of the job area, and the NOSS that have been developed give an insight of the overall picture of the industry. These inputs pave the way and guide the next course of action in restructuring the occupational structure, identifying skills in demand and critical job titles. The requirements of Industry 4.0 as well would give an impact to the future of the manpower in this area.

As to materialise the above, certain research methodologies will be employed. The description of research strategies and approaches in discussed in next chapter.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This section gives an overview of the overall research design, strategies for data collection and data analysis procedure to be performed to meet the objectives of the study.

For the development of the occupational framework for Manufacture of M&E Industry, this study will use two data collection approaches. Methods suggested are document analysis, quantitative and qualitative approach. The quantitative approach utilises survey questionnaire while the qualitative approach will be based on document analysis and focus group discussion with industry experts. By using both methods, better insight of the industry can be obtained besides identification and building appropriate instrument to be used in the quantitative phase.

Before the instrument could be build, the study first starts with qualitative approach and after data and analysis was done, it was followed by quantitative approach where the strategy is to develop the questionnaire with a smaller sample (in qualitative approach) and later applied to a larger sample (quantitative approach). The study design is shown in Figure 3.1.



Figure 3.1: Exploratory sequential mixed methods

The mixed methods design involves three steps as follows:

Step 1: Qualitative Data collection & Analysis: In this phase 10 industry players were selected from managerial level personnel from the Manufacture of Machinery and Equipment Industry. They were selected based on almost similar in experience and occupation. An experienced moderator was chosen to ensure group thinking or having one or two persons dominating the discussion. The objective of the FGD was to develop questionnaires to be used in subsequent survey. An assistant moderator was employed to take down the group discussion. A draft copy of the report will be given to the members for verification as soon as the discussion session ends.

Step 2: Instrument to be used for future survey were built from the reports of the focus group. The outcome from the focus group discussion, four main issues related to the industry namely: competency in demand, jobs in demand, emerging skills and related issues. For content validity, draft of the instrument was sent to an industry expert and an academician.

Step 3: Pre-test was carried out to the prospective respondents once the reliable instrument verified. To ensure reliability of the instrument Cronbach's Alpha value of above 0.7 as suggested by Sakeran (2013) should be achieved.

The Phases of research methodology for manufacturing of M&E industry in Malaysia can be referred at Figure 3.2.

The phases of this study approach is shown as in Figure 3.2 below.

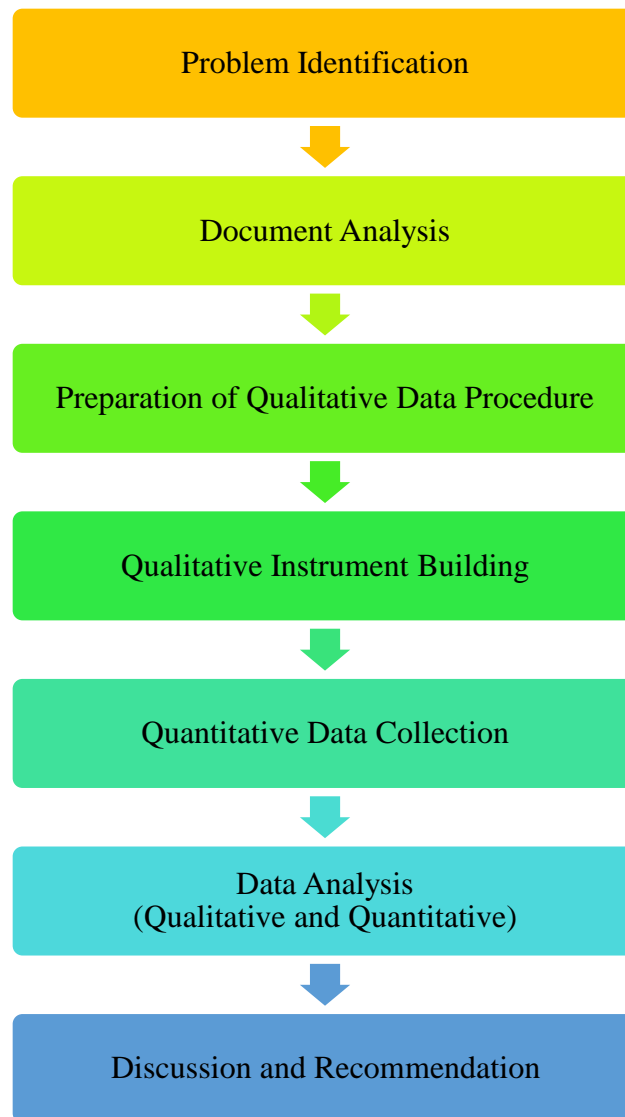


Figure 3.2: Phases of Research Methodology for Manufacturing of M&E industry in Malaysia.

Phase 1: Identification of Research Problem

Broad problem area will be identified through preliminary information gathering which will be from secondary data and literature review.

Phase 2: Document Analysis

Perform actual secondary data collection by reviewing published information available from sources such as websites, archives and other written reports.

Phase 3: Preparation of Qualitative Data Procedure

The interview protocol will be in the form of semi structure questionnaire that will be prepared in line with the objective of this study. The interview protocol will be developed by the researchers themselves. The validity for this study will verified by employing triangulation strategy. In this approach, the researchers will triangulate different data sources of information to build a coherent justification of the different themes in close relation to the aim of the study. Focus group will then be conducted where respondent will be from industry experts and practitioners.

Phase 4: Quantitative Instrument Building

From the focus group discussion, a reliable instrument will be constructed and proposed to be used in the actual field survey.

Phase 5: Quantitative Data Collection

Actual data collection will be carried out. Both self-administered and internet survey will be carried out at nationwide for generalisation purposes. Sample from the establishment will be collected at random to be representative.

Phase 6: Data Analysis for Both Qualitative and Quantitative Data Approach

Final verification by Focus group discussions will be carried out. New focus group members will be selected from industry players who will look at the documents as a whole. They will also be requested to verify the descriptive analysis that was utilised in quantitative approach. The issues of concern will relate to demand for the skills, jobs title, and critical tasks skills level for in the Manufacturing of Machinery and Equipment industry.

Phase 7: Discussion and Recommendation

Final discussion on the study will be established with recommendations.

3.2 Research Approach

There are three research approaches for data collection strategy for this study can be seen on Figure 3.3. Document Analysis, Focus Group Discussion and survey method were used to collect the required data.

Methodology	Approach	Outcome
QUALITATIVE APPROACH		
a) Document Analysis	<u>Approach</u> Review current literature related to the industry such as: i) Articles; ii) Web sites; iii) Statistical data (Census Reports); and iv) Economic Reports, and Industry Reports.	<u>Outcome</u> i) Industry Overview ii) Industry Definitions iii) Industry Stakeholders iv) Industry Legislation v) Industry Intelligence
b) Focus Group Discussions (FGD)	<u>Approach</u> Review current literature related to the industry such as: i) Focus Group Discussions with industry panel members ii) Brainstorming sessions on identifying OS and Occupational Descriptions	<u>Outcome</u> Overview on: i) Industry Issues and Challenges ii) OS iii) Occupational Descriptions iv) Critical job Area & Job Title v) Questionnaire for the survey

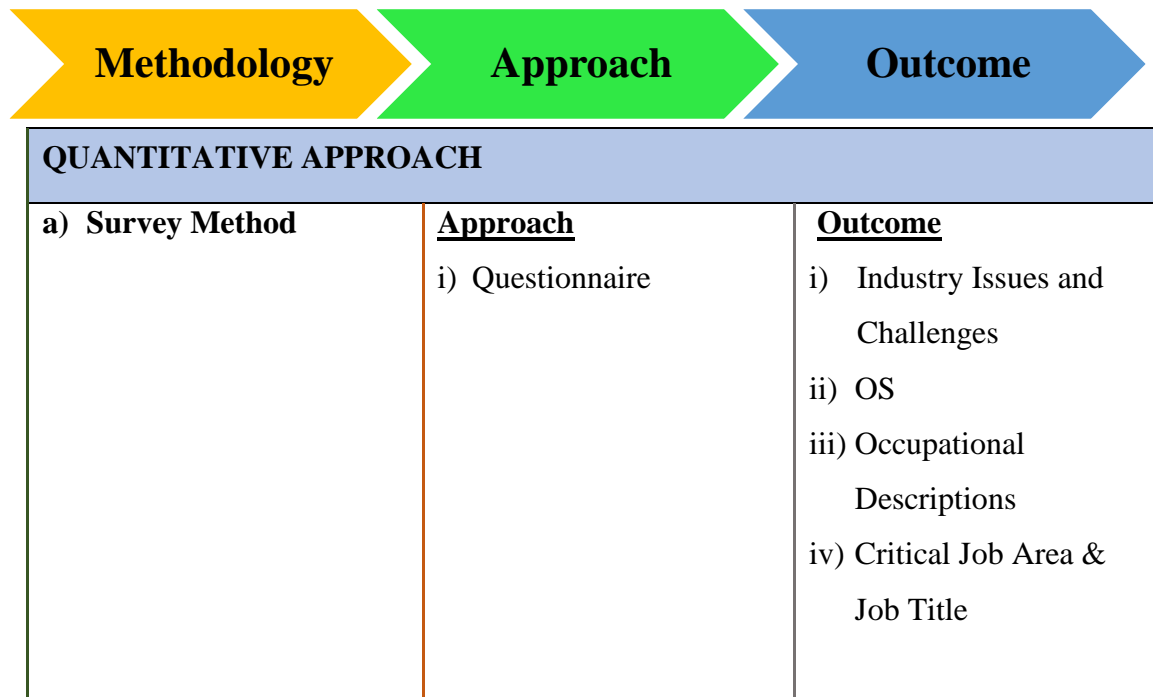


Figure 3.3: Overall Approaches for Data Collection Strategy

3.2.1 Document Analysis

This approach requires rigorous review of existing literature, reports and documents that addresses the study objectives. The review systematically searches by examining work of not only other researcher but also from professional trade reports, internet and articles to get better insight of the industry and address the research aims. This approach will also provide an overview of the industry relevant to the requirement of IR4.0 and industrial need.

a) Data Collection Strategy

There are two main sources for data collection in Document Analysis:

- i) Economic Database; and
- ii) Database from other agencies (such as DOSM and DSD).

i) Economic Database

Some information related to labour and market situation that are highly relevant to this study and the following information were requested from the Department of Statistics Malaysia (DOSM).

- MSIC 2008;
- Occupation categories at 1-digit MASCO 2013; and
- Critical Occupational List (COL) by Talent Corporation Malaysia.

The information from the Economic Database serves two purposes:

- Provide a snapshot of the current Manufacturing of Machinery and Equipment industry landscape and outlook; and
- Serve as control figures and baselining database when assessing data obtained from self-administered and online survey.

ii) Database from other agencies (RMK 11, DSD and others)

The Economic database information from other agencies (local and international) that are relevant Manufacturing of Machinery and Equipment industry were collected and analysed. Based on our initial observation, the following database contain relevant information for the industry.

- Local database – NOSS registry, MIDA and MITI; and
- International database – Organisation for Economic Co-operation and Development (OECD), World Bank and European Union (EU) and Economic Monitor.

b) Data Analyses Procedure

Based on the secondary data from all the report, the following analyses were carried out.

- i) Examining the economic performances of the industry by looking at several macroeconomic indicators (such as GDP, employment and output);
- ii) Analysing the industry outlook in relation to regional and global perspectives;
- iii) Determining the profile of the current and future workforce (such as occupations, and salaries and wages); and
- iv) Reviewing technological development in the industry (such as robotic & automation as well as element of IR4.0).

3.2.2 Focus Group Discussion (FGD)

The Focus Group Discussion (FGD) were involving by the industry expert that are specialised in the MSIC Group 281 and 282 industry. A series of industry engagement based on focus group discussion were conducted to enable in-depth views on the issues of the industry workforce. The FGD were discussing issues on the occupational structure, job description, assessment of curriculum and training programs; accreditation and qualification based on NOSS and MQA framework; potential workforce challenges; future outlook and strategic recommendations to be proposed. Information from the FGD discussion was used to develop the survey method instrument.

A selection of six industry experts was selected and have been endorsed by DSD for focus group discussion. The session was conducted by a facilitator. Facilitators were also commissioned by the DSD to develop occupational standards according to the guidelines that have been set. The function of the facilitator is to find information and develop occupational standards in accordance with the format and formulas prescribed by the DSD while the industry experts must be a person who had at least 7 years' experience in the related industry and worked with the company registered with Suruhanjaya Syarikat Malaysia (SSM). For the FGD session a transcriber was employed to report on the discussion outcome.

Two FGD sessions were conducted. In the first FGD meeting, panels were required to answer semi structured questions. It will be related to Occupational Structure and job description M&E and also was based on four themes namely competency in demand, jobs in demand, emerging skills and related issues has been developed. Critical job in Machinery and Equipment industry was determined in Focus group discussion. Questionnaire for the survey method is expected to be constructed in this FGD session. In the second FGD sessions, panels have verified and validated the results from the field survey.

Sample of FGD semi structured interview questions:

1. What will be the industry Occupational Structure (OS) look like?
2. What will be the job descriptions for each job title?
3. How to determine the demand for the industry skills?
4. How to determine the relevant jobs title that is in line with IR4.0?

a) Data Collection Strategy

Industry experts were engaged for brainstorming and in-depth discussion in the focus group session. Experts from the M&E industry will be identified for further communication and contact. In the process of gathering the much-required information, brainstorming technique was adopted and attended by development panel members who discussed the different sub-sectors and

areas. Facts obtained during the literature review were also discussed and presented by panel members. The information gathered then be used as input to the Occupational Framework of the said sub-sector. Subsequently, several workshops and interviews has been conducted during the development of the M&E industry Occupational Framework. Follow up discussions with the expert panel members has been done in smaller groups to verify the findings of the Occupational Framework was conducted in the second phase.

b) Data Analyses Procedure

The following analyses are expected to be carried-out for FGD sessions.

- i) Examine the potential workforce challenges faced by the overall industry and any important sub-sectors.
- ii) Establish the available job title and career path for each of the job area as determined in the MSIC 2008 and new job area as required by the industry.
- iii) Determine the demand and supply of talent in the Machinery and equipment industry and its' related activities industry based on NOSS and MQA standards.
- iv) Determined the generic job description and responsibility for each of the job title.
- v) Analysis of future trend of the occupational demand by various skill categories including TVET related occupations.
- vi) Validate the instrument for self-administered and internet survey.
- vii) Review of initial findings obtained from the self-administered and internet survey.

c) Analysis Results

The following results was produced based on the analysis. Some of the result are complement to the self-administered and online survey.

- i) Occupational Structure (OS), Job Description and Critical Job Titles.
- ii) Qualitative assessment which will be linked to policy discussion related to industry development and workforce planning.

- iii) Talent gaps between supply and demand of labour according to NOSS and MQA standards.
- iv) Key strategic recommendations and implementable action plans to address talent gaps.

3.2.3 Survey

Self-administered and internet survey will be employed to establish 4 key information namely: competency in demand, jobs in demand, emerging skills and related issues. Google form will be used as a platform for the survey. The survey will specifically be distributed to the related organisation.

Section 1: Competency in Demand

This section is exploring the competency that is required by the industry. Another objective of this section is trying to figure out the skills gap and how to overcome the gap.

Section 2: Jobs in Demand

This section is aimed to determine which category of workers that is in shortage supply or over supply, the category is based on MASCO such as skilled workers, semi-skilled workers and low-skilled workers.

Section 3: Emerging Skills

This section is trying to determine the readiness of industry players and the workers in the advent of IR4.0. The technology drives or pillars of IR4.0 is listed and the respondents have to decide the relevancy of each elements in their line of duty.

Section 4: Related Issues

This section is exploring the common issues surrounding the industry. The respondents are asked to suggest ways of overcoming those issues.

a) Establishment and Sampling procedure

The establishment of this study consists of companies in Malaysia. According to Roscoe (1975), sample size of 30 and less than 500 are appropriate for most research. Therefore, since the total number of establishments is 2,601 companies, the number of sample establishments is 66 and number of targeted respondents are 35. However, to minimize errors in sampling and to take care issues of non-response, the number of targeted respondents were doubled and a total of 60 questionnaires were distributed to selected companies or organisations. For respondent's response rate, based on Brauch, Y & Holtom, B.C (2008), the average level of response rate is 52.7 per cent. After data collected exercise was conducted, there are 50 totals of questionnaire collected. The targeted respondents were among the managerial levels in the related company and association in the industry or human resources director which is cover from Group 281 Manufacture of General-Purpose Machinery and Group 282 Manufacture of Special-Purpose Machinery.

Based on sample size calculator software Raosoft, the sample size was calculated and the results was shown in Table 3.1. This research used 10% margin of error based on Weisberg & Bowen (1977) which stated 10% margin of error are acceptable for this kind of research.

The development of the Occupational Structure (OS) for group 281 and 282 was merge together. Based on input and recommendation from the industry expert, the job area for both areas was similar as the job area was based on engineering discipline which include mechanical, electrical, electronic and other engineering discipline. However, there are also specific job area developed based the occupational area. Specific job area for robotic industry and automation engineering was also developed to cater for the industry trend for IR4.0.

Table 3.1: Number of Targeted Respondents According to MSIC 2008 Group

SECTION	C	MANU-FACTURING	NUMBER OF ESTABLISHMENT	NUMBER OF SAMPLE ESTABLISHMENT	NUMBER OF TARGETED RESPONDENTS	NUMBER OF ACTUAL RESPONDENTS
Division	28	Manufacture of Machinery and equipment				
Group	281	Manufacture of general-purpose machinery	2601	66	35	50
	282	Manufacture of special-purpose machinery				

b) Questionnaire Design

For this study, the questionnaires were design based on the feedback from the first focus group discussion which focus on the 4 key important element which is competency in demand, jobs in demand, emerging skills and related issues.

To increase response rate and consistent responses, the questionnaires are designed based on close ended question based on interval scale appropriate to the instrument. Content validity and face validity was employed. Content validity has been carried out in the pre-test stage by two experts from academic and industry sector. They has looked into the content, grammar, phrasing of sentences and understanding of the items used. After pre-testing stage is completed, a pilot test has conducted to retest the instruments for this study among at least 10 responds similar to the actual survey that will be conducted.

c) Measures and Instrumentation

For this study, there will be measures used in the section in the questionnaire. As for section 1, it will discuss regarding competency in demand and will use 5 interval scale ranging from 5 (Highly Importance), 4 (Importance), 3 (Moderate), 2 (Insignificant) and 1 (Low in Significant) measuring the intensity of job demands against supply or labour.

For section 2, it will discuss on jobs in demand and will use 3 interval scale ranging from 3 (Low Shortage), 2 (Mid Shortage) and 1 (High Shortage) measuring the shortage of manpower in M&E Industry.

For section 3, Emerging skills will be discussed in this section. It contains close ended question and questions that will use also 3 interval scale ranging from 1 (High in demand), 2 (In Demand) and 3 (Low in demand) measuring the important prerequisite and skills for IR4.0 in M&E Industry.

For section 4, related issues regarding the industry will be discuss and 4 interval scale ranging from 4 (Strongly Agree), 3 (Agree), 2 (Disagree) and 1 (Strongly disagree) measuring the key issues in M&E Industry.

d) Data Collection Strategy

Costing is an important consideration that influences the determination of sampling size for a primary survey. The establishment of the industry is large and require a significant financial budget if a nationally representative survey is the primary target. The consultation with related associations concluded that a nationally representative survey will not be feasible. Instead of aiming for a nationally representative sample, our survey aims to increase participation rates from industries.

Besides giving some incentives, two approaches strategy for the data collection will be operationalise.

- i) Approaching the related associations' members. The secretariat of each association has agreed to distribute the questionnaire. Industry engagements/interviews/visits were scheduled to seek their assistance to distribute the online survey to the members of respective associations.
- ii) Assistance from MITI & MIDA may also be required to provide the institutional support when engaging the selected respondents.

However, to lessen bias in the survey procedure, as suggested by Armstrong and Overton (1977) extrapolation method was employed. Non-response bias (error) occurs when respondents vary in significant ways from the non-respondents in the research (Sekaran, 2013) which is common in self-administered and via mail surveys method (Armstrong & Overton, 1977; Groves, 2002). For this study, personal distribution of survey questionnaire (self-administered) method were employed for data collection. non-response from respondents, usually occurs when respondents declined to answer or have language problems (Groves, 2002). For this study, in order to encourage good response rates from the respondents, a token of appreciation were given to respondents for each questionnaire completed.

e) Data Analysis Procedure

The following analyses are expected to be performed for the field survey both self-administered and online survey.

- i) Descriptive analysis of employment profiles and other variables that are included in the questionnaire.
- ii) Analysis of critical occupations identified by the industry
- iii) Analysis of future trend of the occupational demand by various skills category including TVET related occupations.
- iv) Analysis of talent gaps between supply and demand according to NOSS and MQA standards
- v) Analysis of training provided by industries to employees

3.3 Conclusion

For this study, the selected research methodologies are document analysis, survey method and focus group discussion. Quantitative analysis for these studies has been selected to generalise on the industry under the determined MSIC Division and group. Besides two other research approach has been utilised namely: document analysis and focus group discussion method for the study of this area.

Document analysis was chosen due to it is an efficient and effective way of gathering data because documents are manageable and practical resources. Documents are commonplace and come in a variety of forms, making documents a very accessible and reliable source of data. Obtaining and analysing documents is often far more cost efficient and time efficient than conducting the research and experiment. Document analysis are suitable method for this research because of this research required more information such as current statistics for related industry and the growth of the industry.

Focus group discussion was also be deployed in this research due to free and open discussion among the respondents results in generation of new ideas that can be very useful for decision-making. It also a fast way to gain the needed information regarding job title in the related industry. This approach is time saving and effective way to gather information from many sources.

Therefore, these three approaches are appropriate to obtain the necessary information related to this industry. This is done by leveraging the experience of 6 to 8 people who experienced industry experts for more than 7 years' experience in the various area the industry, with the information obtained and gathered from the sources and reports available are adequate.

The results of the OS and OD development and skills in-demand identified by focus group are presented in the next chapter, Chapter 4: Findings.

CHAPTER 4: FINDINGS

4.1 Introduction

This chapter elaborates the findings of this study. The findings revolve around the objectives set for the study namely; to produce Occupational Structure (OS) from data analysis and Focus Group Discussion (FGD); to determine job descriptions of each job title from the OS; and to investigate the competency in demand in the sector.

4.2 Findings Analysis

This section provides information regarding findings result based on FGD and survey result for M&E industry based on scope of MSIC 2008.

4.2.1 Discussion of Results

The findings of this research were obtained by document analysis, FGD with the involvement of industry representative during the development workshops and survey, which the OS and Occupational Description (OD) of the industry is produced. The discussions also have identified the jobs in demand, competency in demand, emerging skills and related issues for Manufacture of M&E industry. The OF will be discussed based on the two (2) main group in Division 28 which were;

- a) Manufacture of general-purpose machinery
- b) Manufacture of special-purpose machinery

A total of 50 respondents have participated in this survey. Based on result findings, show the number of samples establishment and number of targeted respondents are sufficient enough to cover the sampling of establishment of the M&E industry. The details can be referred table 3.1.

4.2.2 Jobs in Demand

Based on FGD, definition of skilled worker is at level four (4) and above such as managerial duties, while semi-skilled worker is at level 2 and 3 such as technician/machinist and supervisor and low skilled worker is as a general worker at level 1 in this industry. The jobs in demand were identified and listed in the table 4.1.

The job titles were divided in three categories of workers, which are low-skilled workers, semi-skilled workers and skilled workers. The classification is based on MASCO's categories of workers and taking into account the definition outlined in MOSQF level descriptors.

There is two (2) analysis result for jobs in demand, which is;

a) FGD result

From FGD session, the industry expert identified the job area and categories the job title for the jobs in demand. There are many factors contributing to the jobs in demand and the discussion result was tabled in the Table 4.1.

Table 4.1: Jobs in demand based on FGD result

NO.	CATEGORY OF WORKER (JOB TITLES)	FACTOR(S) CONTRIBUTING TO THE DEMAND	SPECIFIC REQUIREMENTS AND SKILLS
1	Low skilled workers	a) Difficulties in recruiting local workers due to terms and condition of the job being offer (salary scheme, working hour). b) Work pressure. c) Lack of social skills.	a) Demand for permanent job. b) Normal working hours. c) Able to adapt with work pressure. d) Able to interpret instructions and simple diagrams. e) Communication skills.

CATEGORY NO.	OF WORKER (JOB TITLES)	FACTOR(S) CONTRIBUTING TO THE DEMAND	SPECIFIC REQUIREMENTS AND SKILLS
2	Semi-skilled workers	a) Mismatch of qualification, knowledge and required skills to perform the job function. b) High salary expectation. c) Limited requirement for personnel in the sector.	a) Qualification which is relevant to the job function. b) Knowledge which is required to perform the job function. c) Skills which is required to execute the task.
3	Skilled workers	a) Mismatch of qualification, knowledge and required skills to perform the job function. b) High salary expectation. c) Limited requirement for personnel in the sector.	a) Qualification which is relevant to the job function. b) Knowledge which is required to perform the job function. c) Skills which is required to execute the task. d) Operation and management skills. e) Knowledge on current or latest technology. f) Team work, leadership skills and communication skills. g) Analytical skills.

b) Survey result

From survey, the result for jobs in demand based on MASCO skills category. Based on figure 4.1, majority of respondents agreed that jobs in demand in M&E Design area are from skilled worker with 34 respondents choose skilled worker as high demand jobs in M&E Design area.

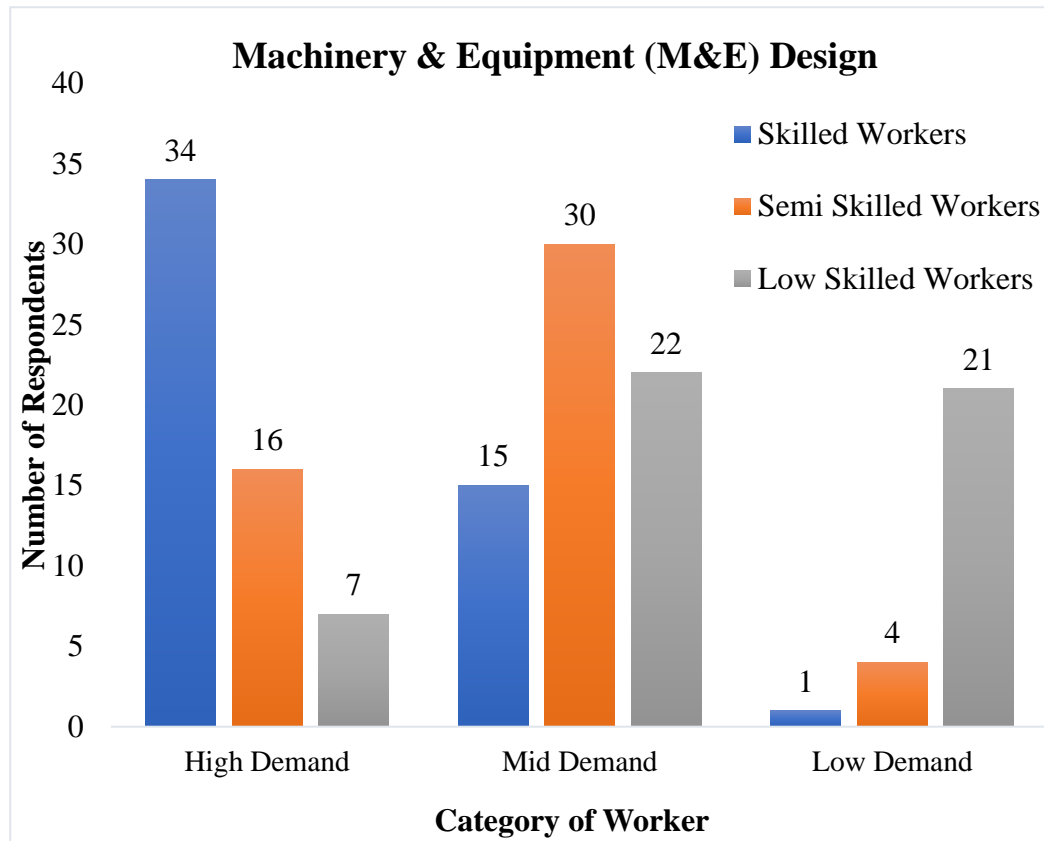


Figure 4.1: Machinery & Equipment (M&E) Design

Based on Figure 4.2, majority of respondents agreed that jobs in demand in M&E Fabrication, Assembly and Repair area are from semi-skilled worker with 29 respondents choose semi-skilled worker as high demand jobs in M&E Fabrication, Assembly and Repair area.

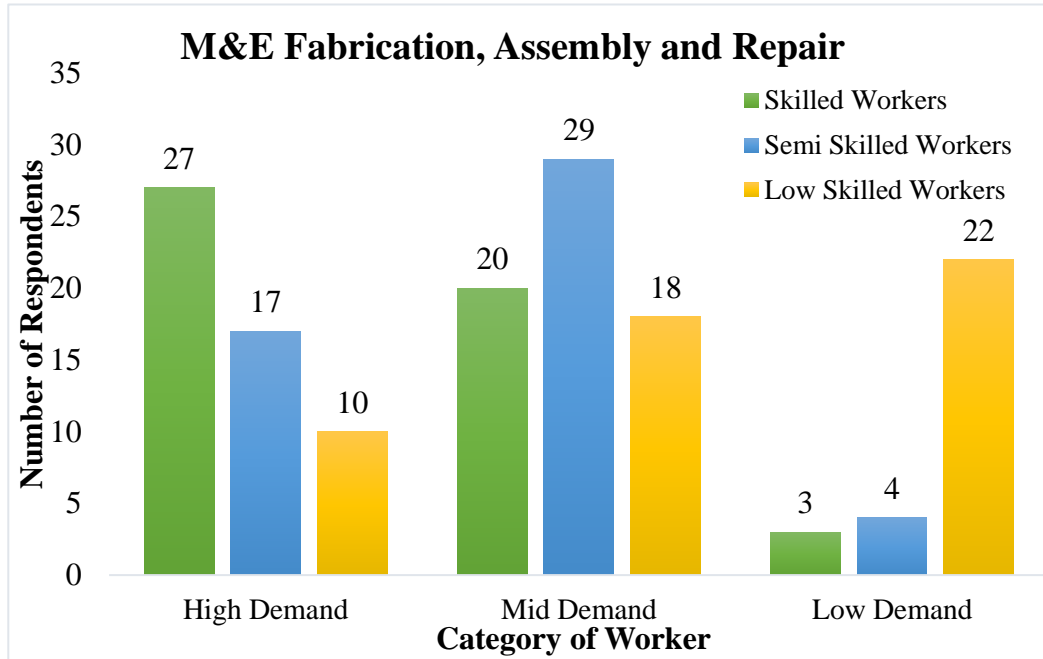


Figure 4.2: M&E Fabrication, Assembly and Repair

Based on Figure 4.3, majority of respondents agreed that jobs in demand in Metal Machining and Special Tooling area are from semi-skilled worker with 32 respondents choose semi-skilled worker as high demand jobs in Metal Machining and Special Tooling area.

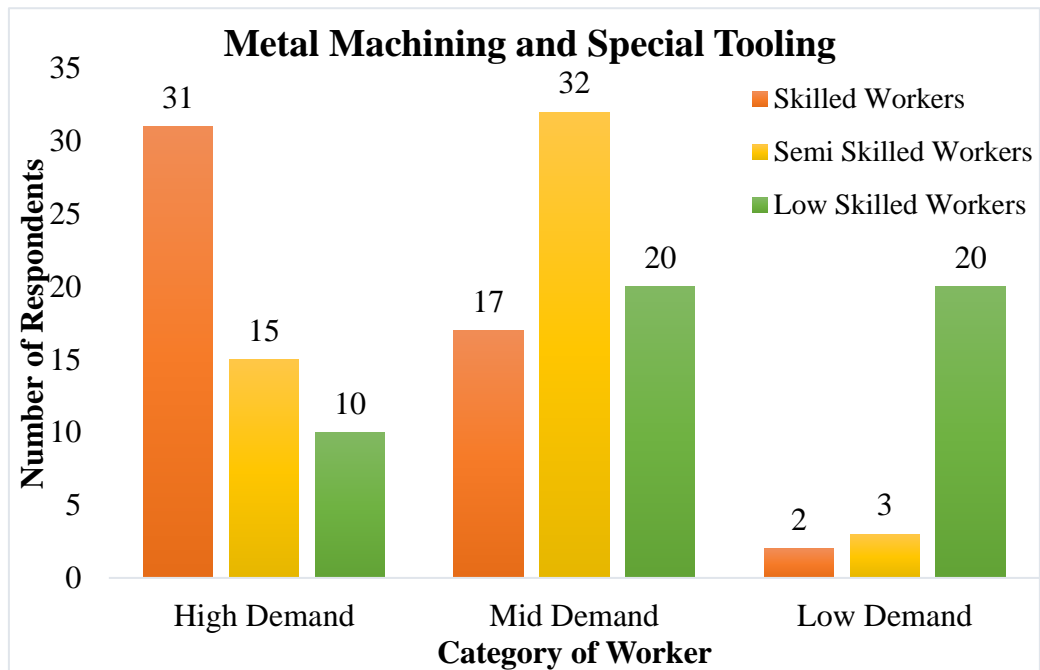


Figure 4.3: Metal Machining and Special Tooling

Based on Figure 4.4, majority of respondents agreed that jobs in demand in Quality Management area are from semi-skilled worker with 29 respondents choose semi-skilled worker as high demand jobs in Quality Management area.

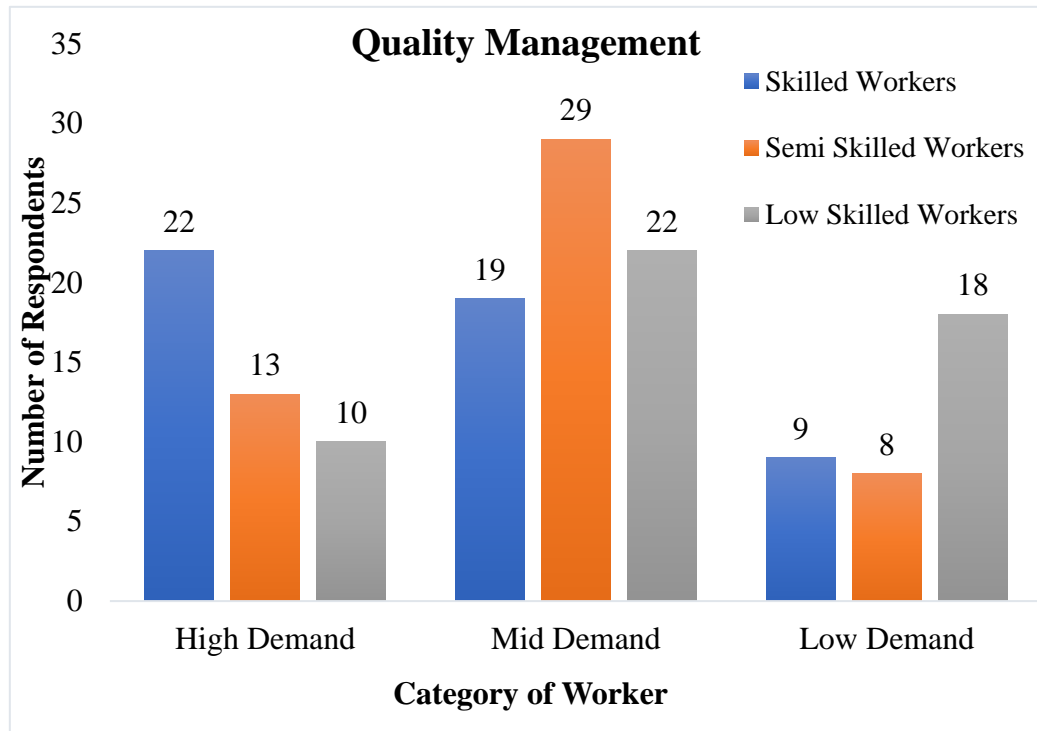


Figure 4.4: Quality Management

Based on Figure 4.5, majority of respondents agreed that jobs in demand in Industrial Automation Engineering area are from skilled worker with 35 respondents choose skilled worker as high demand jobs in Industrial Automation Engineering area.

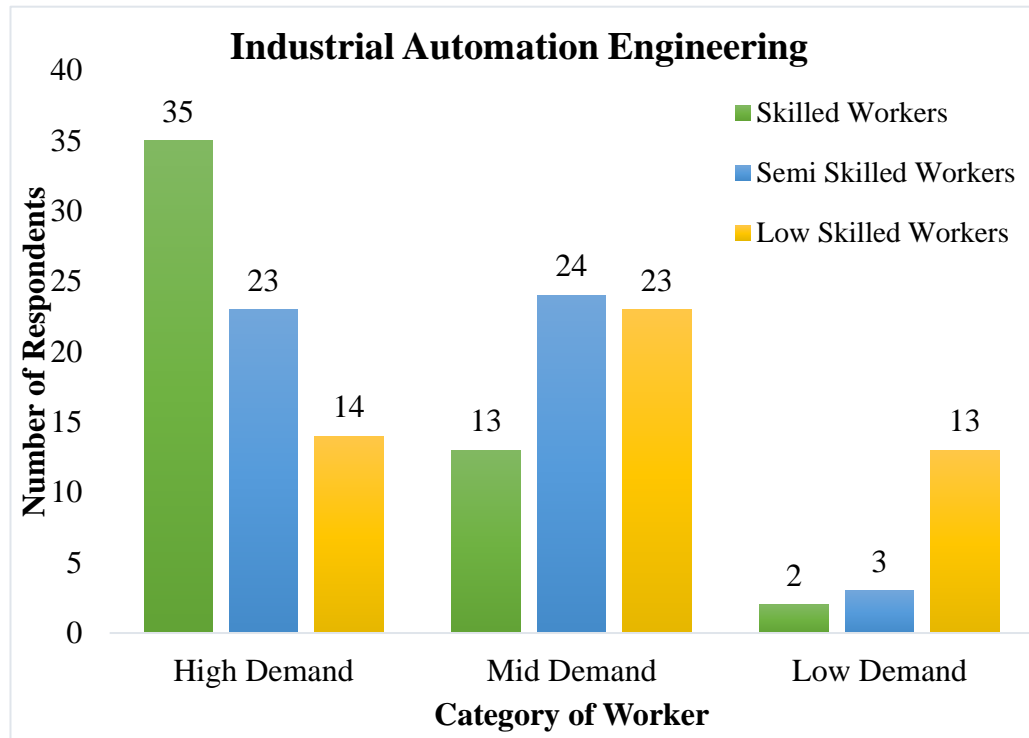


Figure 4.5: Industrial Automation Engineering

c) Conclusion

Based on the findings, the result for Jobs and Demand was parallel for FGD and survey result. It can be concluded that the workers that categorised under skilled and semi-skilled worker was very demanding in the industry. Any training program related to M&E should focus on this area. Table 4.2 shows the mapping between OS, E-Masco and COL.

Table 4.2: Occupational Structure vs E-Masco vs Critical Occupational List

NO.	AREA	JOB TITLE	OS	E-MASCO	COL
1	Machinery & Equipment (M&E) Design - Electrical	R&D Engineer (Electrical)	✓	✓	✓
2	Machinery & Equipment (M&E) Design - Electrical	R&D Assistant Engineer (Electrical)	✓	✓	

NO.	AREA	JOB TITLE	OS	E-MASCO	COL
3	Machinery & Equipment (M&E) Design - Electrical	Electrical Supervisor	✓	✓	✓
4	Machinery & Equipment (M&E) Design - Electrical	Electrical Technician	✓	✓	✓
5	Machinery & Equipment (M&E) Design - Control System	R&D Engineer (Control System)	✓		
6	Machinery & Equipment (M&E) Design - Control System	R&D Assistant Engineer (Control System)	✓		
7	Machinery & Equipment (M&E) Design - Mechanical	R&D Engineer (Mechanical)	✓		✓
8	Machinery & Equipment (M&E) Design - Mechanical	R&D Assistant Engineer (Mechanical)	✓		
9	Machinery & Equipment (M&E) Design - Mechanical	Mechanical Supervisor	✓		✓
10	Machinery & Equipment (M&E) Design - Mechanical	Mechanical Technician	✓	✓ /	✓
11	Metal Machining – Turning, Milling & Boring	Metal Machining Production Engineer	✓		
12	Metal Machining – Turning, Milling & Boring	Metal Machining Production Assistant Engineer	✓		
13	Metal Machining - Grinding	Metal Machining Production Engineer	✓		
14	Metal Machining - Grinding	Metal Machining Production Assistant Engineer	✓		
15	Metal Machining - Honing	Metal Machining Production Engineer	✓		

NO.	AREA	JOB TITLE	OS	E- MASCO	COL
16	Metal Machining - Honing	Metal Machining Production Assistant Engineer	✓		
17	Computer Numerical Control (CNC) Machine Operation - Turning	Metal Machining Production Engineer	✓		
18	Computer Numerical Control (CNC) Machine Operation - Turning	Metal Machining Production Assistant Engineer	✓		
19	Computer Numerical Control (CNC) Machine Operation – Milling & Boring	Metal Machining Production Engineer	✓		
20	Computer Numerical Control (CNC) Machine Operation – Milling & Boring	Metal Machining Production Assistant Engineer	✓		
21	Computer Numerical Control (CNC) Machine Operation - Grinding	Metal Machining Production Engineer	✓		
12	Computer Numerical Control (CNC) Machine Operation - Grinding	Metal Machining Production Assistant Engineer	✓		
22	Heat Treatment	Metal Machining Production Assistant Engineer	✓		
23	Heat Treatment	Heat Treatment Metallurgist	✓		✓
24	Protective Coating - Plating	Heat Treatment Assistant Metallurgist	✓		
25	Protective Coating - Plating	Plating Engineer	✓		
26	M&E Fabrication, Assembly and	Plating Assistant Engineer	✓		

NO.	AREA	JOB TITLE	OS	E-MASCO	COL
	Repair - Industrial Engineering				
27	M&E Fabrication, Assembly and Repair - Industrial Engineering	Industrial Engineer	✓	✓	✓
28	M&E Fabrication, Assembly and Repair - Electrical	Industrial Assistant Engineer	✓		
29	M&E Fabrication, Assembly and Repair - Electrical	Electrical Engineer	✓	✓	✓
30	M&E Fabrication, Assembly and Repair - Electrical	Electrical Assistant Engineer	✓	✓	
31	M&E Fabrication, Assembly and Repair - Electrical	Electrical Supervisor	✓	✓	✓
32	M&E Fabrication, Assembly and Repair - Electronic	Electrical Technician	✓	✓	✓
33	M&E Fabrication, Assembly and Repair - Electronic	Electronic Engineer	✓		✓
34	M&E Fabrication, Assembly and Repair - Mechanical	Electronic Assistant Engineer	✓		
35	M&E Fabrication, Assembly and Repair - Mechanical	Mechanical Engineer	✓	✓	✓
36	M&E Fabrication, Assembly and Repair - Mechanical	Mechanical Assistant Engineer	✓		
37	M&E Fabrication, Assembly and Repair - Mechanical	Mechanical Supervisor	✓		✓
38	Manufacture of Machinery and Equipment Quality Management - Quality Control	Mechanical Technician	✓	✓	✓

NO.	AREA	JOB TITLE	OS	E- MASCO	COL
39	Manufacture of Machinery and Equipment Quality Management - Quality Control	Quality Control Engineer	✓		✓
40	Manufacture of Machinery and Equipment Quality Management - Quality Assurance	Quality Control Assistant Engineer	✓		
41	Manufacture of Machinery and Equipment Quality Management - Quality Assurance	Quality Assurance Engineer	✓	✓	✓
42	Robotic Engineering - Robot Design	Quality Assurance Assistant Engineer	✓		
43	Robotic Engineering - Robot Design	Robot Designer	✓		
44	Robotic Engineering - Robot Design	Robot Assistant Designer	✓		
45	Robotic Engineering - Integrated Robotic System Design	Robot Making Technician	✓		
46	Robotic Engineering - Integrated Robotic System Design	Robotic System Design Engineer	✓		
47	Robotic Engineering - Integrated Robotic System Design	Robotic System Design Assistant Engineer	✓		
48	Robotic Engineering - Robotic Programming	Robotic Operation Operator	✓		
49	Robotic Engineering - Robotic Programming	Robotic System Design Engineer	✓		

NO.	AREA	JOB TITLE	OS	E- MASCO	COL
50	Robotic Engineering - Robotic Programming	Robotic System Design Assistant Engineer	✓		
51	Robotic Engineering - Robotic Operation Control & Maintenance	Robotic Operation Operator	✓		
52	Robotic Engineering - Robotic Operation Control & Maintenance	Robotic System Design Engineer	✓		
53	Robotic Engineering - Robotic Operation Control & Maintenance	Robotic System Design Assistant Engineer	✓		
54	Automation System Engineering - Electrical	Robotic Operation Operator	✓		
55	Automation System Engineering - Electrical	Electrical Engineer	✓		✓
56	Automation System Engineering - Electrical	Electrical Assistant Engineer	✓	✓	
57	Automation System Engineering - Electrical	Electrical Supervisor	✓	✓	✓
58	Automation System Engineering - Electronic	Electrical Technician	✓	✓	✓
59	Automation System Engineering - Electronic	Electronic Engineer	✓		✓
60	Automation System	Electronic Asst. Engineer	✓		

NO.	AREA	JOB TITLE	OS	E- MASCO	COL
	Engineering - Electronic				
61	Automation System Engineering - Electronic	Electronic Supervisor	✓		✓
62	Automation System Engineering - Mechatronic	Electronic Technician	✓		✓
63	Automation System Engineering - Mechatronic	Mechatronic Engineer	✓		✓
64	Automation System Engineering - Mechatronic	Mechatronic Asst. Engineer	✓		
65	Automation System Engineering - Mechatronic	Mechanical Supervisor	✓		✓
66	Automation System Engineering - Mechanical	Mechanical Technician	✓	✓	✓
67	Automation System Engineering - Mechanical	Mechanical Engineer	✓	✓	✓
68	Automation System Engineering - Mechanical	Mechanical Assistant Engineer	✓	✓	
69	Automation System Engineering - Mechatronic	Mechatronic Supervisor	✓		✓
70	Automation System Engineering - Mechatronic	Mechatronic Technician	✓		✓

Based on the mapping from the OS, e-Masco and COL, the result shows that job title that based on engineering discipline includes mechanical, electrical, electronic are mapped whereas for the specific job area such as for metal machining, Computer Numerical Control (CNC) machine operation and robotic engineering are not mapped in the e-Masco or COL.

4.2.3 Competency in Demand

Definition for competency in demand for this analysis are define as the set of particular qualities required by the industry for employees to possess. The competencies can be used to benchmarks to assess and evaluate the workers quality.

The discussion and output from competency in demand analysis for the workers in the M&E industry is based on two (2) method from the FGD and survey. The discussion result for FGD is tabled on Table 4.3 and survey analysis result is depicted on Figure 4.6.

Table 4.3: Competency in Demand

NO	COMPETENCY IN DEMAND	FACTOR(S) CONTRIBUTING TO THE DEMAND	SPECIFIC REQUIREMENTS AND SKILLS
1	a) Planning and Organising skills. b) Social skills (interpersonal, communication, language, etc). c) Negotiation skills.	a) No structured system to transfer skill to new successor. b) Lack of exposure on process. c) Lack of hands on experience on process.	a) Training on related or similar areas. b) Review of training syllabus at training centre/ provider. c) Joint venture with industry player in knowledge/technology transfer and experiencing industry operation environment. d) Invite industry player to jointly carry out R&D programs.

NO	COMPETENCY IN DEMAND	FACTOR(S) CONTRIBUTING TO THE DEMAND	SPECIFIC REQUIREMENTS AND SKILLS
2	a) Troubleshooting / problem solving skills. b) Competent in using latest technology. c) Programming language competency.	a) No established written procedure on handling such product. b) No established written material on latest technology for reference.	a) Training on related or similar areas. b) Review of training syllabus at training centre/ provider. c) Joint venture with industry player in knowledge/technology transfer and experiencing industry operation environment. d) Invite industry player to jointly carry out R&D programs.

The findings from the FDG input shows that the skills and competency demand is caused by external and internal factor. The factor can be summarised as the lack of structured system and lack of manuals and standard in the industry for transferring the technical know-how or the soft skills to new employed workers in the industry. The FGD has provide specific area requirement and skills for the issues arise.

Based on Figure 4.6, respondents have agreed that all the competency are rated highly importance to the industry.

Based on the findings, the result for the Competency in demand analysis shows that it is very importance for employee to have the required skills and competency by the industry. The analysis result for the seven (7) skills and competency area which include communication, teamwork, problem solving, negotiation, planning and organising, self-management/independent and self-learning all shows that they are highly importance for the industry.

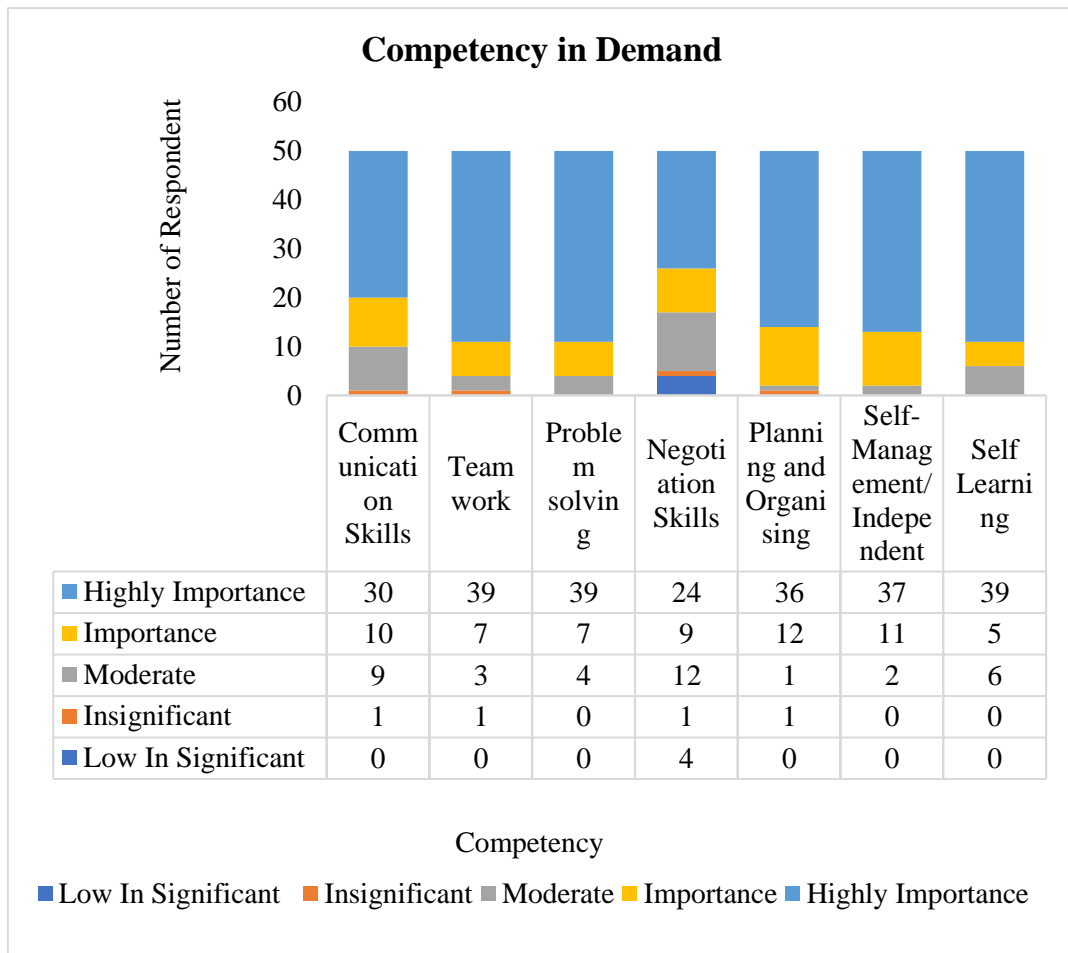


Figure 4.6: Competency in Demand

Below is the description for each competency in demand;

a) Teamwork (Highly importance, 39)

The collaborative effort of a group to achieve a common goal or to complete a task in the most effective and efficient way.

b) Problem solving (Highly importance, 39)

Problem solving is ability to follow up on one's action and check whether or not the problem is actually solved

- c) Self-Learning (Highly importance, 39)
Having knowledge or skills acquired by one's own efforts without formal instruction.
- d) Self-Management/Independent (Highly importance, 37)
Our abilities to control our feelings, emotions, and activities.
- e) Planning and Organising (Highly importance, 36)
Ability to create a realistic of project plan in terms of budgets and arrangement of work. Able to making a major decision.
- f) Communication skills (Highly importance, 30)
Abilities you use when giving and receiving different kinds of information. Communication skills involve listening, speaking, observing and empathizing. It is also helpful to understand the differences in how to communicate through face-to-face interactions, phone conversations and digital communications, like email and social media.
- g) Negotiation skills (Highly importance, 24)
Qualities that allow two or more parties to reach a compromise. These are often soft skills and include abilities such as communication, persuasion, planning, strategizing and cooperating.

4.2.4 Emerging Skills

The rise of new digital industrial technology, known as IR4.0, is a transformation that makes it possible to gather and analyse data across machines, enabling faster, more flexible, and more efficient processes to produce higher-quality goods at reduced costs. However, depending on the occupation, the required skills can be very different. Based on a discussion and analysis, below is the input for emerging skills in IR4.0 for M&E industry. The FGD has outlining the job titles related to IR4.0 and the reason of why they requires the related IR4.0 skills as shows in Table 4.4. The survey result for the emerging skills was depicted in Figure 4.7.

Table 4.4: Emerging Skills

EMERGING SKILLS	JOB TITLES RELATED TO IR4.0	REASON OF REQUIRED EMERGING SKILLS
IR4.0 related skills – interpretation of Big Data, Internet of Things (IoT), Supply Chain, Cloud & Cybersecurity, Artificial intelligence, Horizontal & Vertical Integration, Simulation Augmented Reality, Utilisation of automation systems which include ability to configure, utilise, debug, maintain the system	<ol style="list-style-type: none"> 1. R&D Engineer (Electrical) 2. R&D Assistant Engineer (Electrical) 3. Electrical Supervisor 4. Electrical Technician 5. R&D Engineer (Control System) 6. R&D Assistant Engineer (Control System) 7. Electronic Supervisor 8. Electronic Technician 9. R&D Engineer (Mechanical) 10. R&D Assistant Engineer (Mechanical) 11. Mechanical Supervisor 12. Mechanical Technician 13. Robotic Engineering Specialist 14. Robot Designer 15. Robot Assistant Designer 16. Robot Making Technician 17. Robotic Engineering Specialist 18. Robotic System Design Engineer 19. Robotic System Design Assistant Engineer 	<ol style="list-style-type: none"> a) Increase productivity, reduce cost and improve efficiency b) Minimise human error c) Fast decision making d) Increase process effectiveness

EMERGING SKILLS	JOB TITLES RELATED TO IR4.0	REASON OF REQUIRED EMERGING SKILLS
	20. Robotic Operation Operator 21. Robotic Engineering Specialist 22. Robotic Programming System Analyst 23. Robotic Lead Programmer 24. Robotic Operation Operator 25. Robotic Operation Specialist 26. Robotic Operation Engineer 27. Robotic Operation Assistant Engineer 28. Robotic Operation Operator 29. Electric Automation System Specialist 30. Electrical Engineer 31. Electrical Assistant Engineer 32. Electrical Supervisor 33. Electrical Technician 34. Electronic Automation System Specialist 35. Electronic Engineer 36. Electronic Assistant Engineer 37. Electronic Supervisor 38. Electronic Technician 39. Mechatronic Automation System Specialist 40. Mechatronic Engineer 41. Mechatronic Assistant Engineer	

EMERGING SKILLS	JOB TITLES RELATED TO IR4.0	REASON OF REQUIRED EMERGING SKILLS
	42. Mechatronic Supervisor 43. Mechatronic Technician 44. Mechanical Automation System Specialist 45. Mechanical Engineer 46. Mechanical Assistant Engineer 47. Mechanical Supervisor 48. Mechanical Technician	

The FGD has listed total of 48 job title that relevant to IR4.0. The list is determined based on the scope of work of each of the job title which has the relation on IR4.0.

Based on the survey findings, all the identified job area in the M&E industry requires IR4.0. But two (2) area standouts from the other 6 job areas which is the Machinery & Equipment (M&E) Design and M&E Fabrication, Assembly and Repair.

Based on focus group discussion and survey conducted, it can be seen that, the emerging skills in the M&E industry is very important for the industry. As a subset from Manufacturing Industry, M&E industry plays an important role in providing the technology, machinery and equipment for manufacturing and production process. It is very important for the industry to leverage on the IR4.0 to increase the efficiency and productivity.

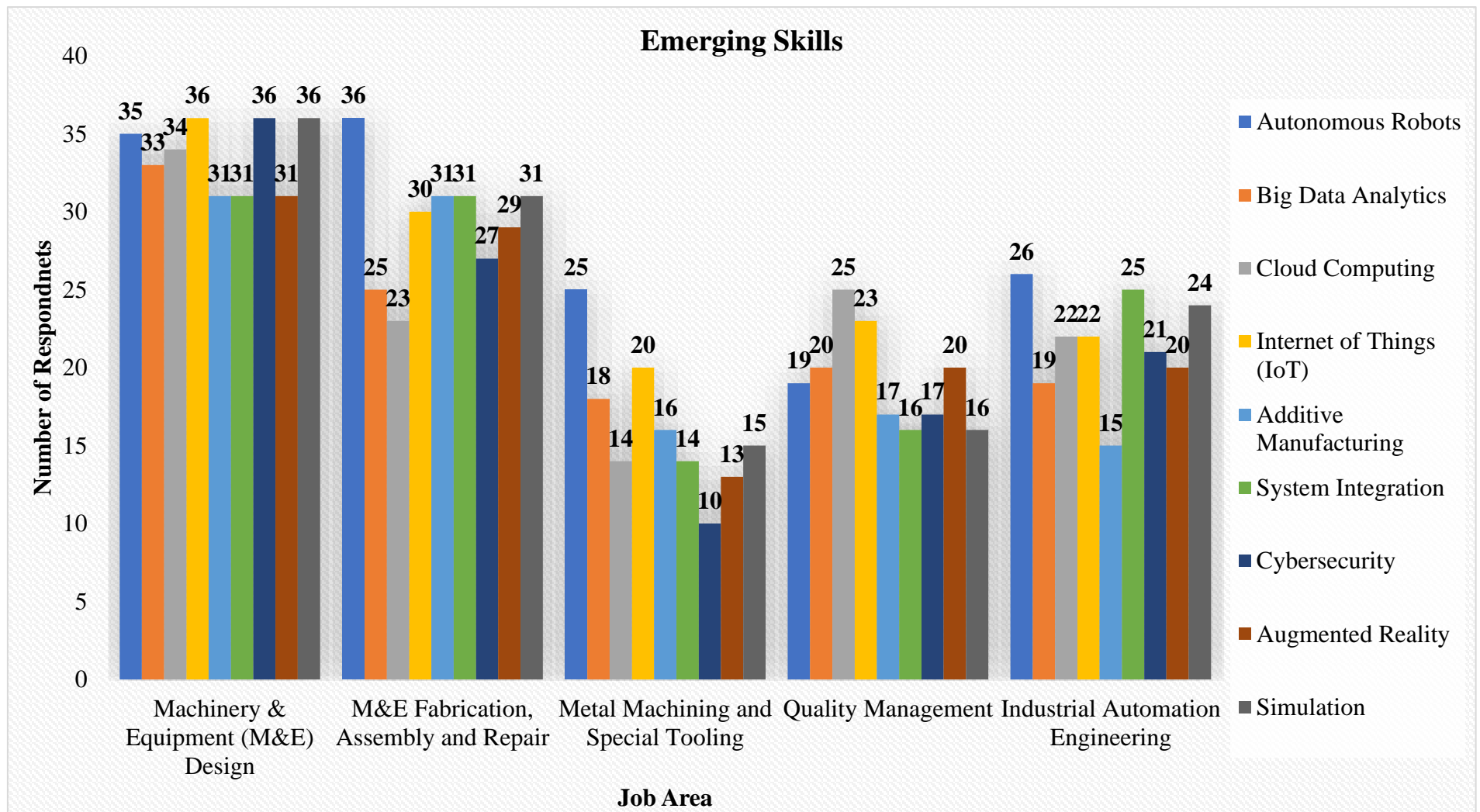


Figure 4.7: Emerging Skills

4.2.5 Related Issues in Machinery & Equipment Industry

The industry's common issues are explored in this section. The respondents are suggesting ways to overcome these problems by survey that have been distributed. Furthermore, related issues for the M&E industry also have been identified during focus group discussion and listed in the Table 4.5 below. Based on the list and further discussion, FGD panels suggested ten key issues to be put in the survey. Results of the survey regarding related issues are shown in Figure 4.8.

Table 4.5: Related Issues

No.	Key Issues	Discussion	Suggestion
1.	Insufficient manpower	a) Demanding work condition. b) 3D (Dirty, Dangerous, Difficult). c) Unattractive wages and fringe benefits. d) Negative perception by community – M&E as backward.	a) Minimum wage policy. b) Review wages scheme on productivity based.
2.	Low skilled and low performance workforce.	a) Lack of training facilities and talent management from the employees. b) Low motivation and rewards.	Government Incentives and Intervention.
3.			

No.	Key Issues	Discussion	Suggestion
	High dependency on foreign labour.	a) 3D (Dirty, Dangerous, Difficult). b) Reliable and favourable for higher productivity than local workers. c) Inability to convince young generation to participate in M&E sector.	Both government and private sector should give concerted and continuous effort in controlling the intake of foreign labours and attract more locals.
4.	Underpayment of wages lead to high turnover.	Salary wages does not match with productivity and job requirements.	Profit sharing – changing the mindset of the managerial to create harmonise salary scheme.
5.	Economic conditions.	Low market price.	a) Enforcement from related government agencies. b) Diversification economic activities. c) Integration M&E management strategies.
6.	Technological change.	a) Slow technological innovation and adoption. b) Lack of capital investment.	Financial facilities by public fund with incentives.

No.	Key Issues	Discussion	Suggestion
7.	Resistance to change among industry players.	a) Attitude and perception b) Poor technology adoption and advancement.	Empowering industry players and workers with current technology trend including IR4.0
8.	Youth Involvement.	a) Poor technology adoption and advancement. b) Negative perception.	a) Enhancement of awareness and promotional activity. b) Integration of skill training and learning.
9.	Poor facilities and amenities for workers.	A direct impact of high workers turnover and labour shortages.	Industry players need to upgrade facilities and amenities for M&E workers.
10.	Insufficient of extension officer services.	Ratio of extension agents to coverage area is imbalance which lead to less training and monitoring of workers and growers.	Government policies and intervention.
11.	Lack of Industry Player	Lack of expertise for Malaysian company to involve in R&D for M&E.	Government to initiate various support for industry including providing training and monetary incentive for industry to venture into M&E industry.

Figure 4.8 shows the related issues regarding to M&E industry from the survey distributed. Based on the result, the most important issues regarding M&E industry based on strongly agree from 50 respondents are technological change, insufficient manpower, underpayment of wages lead to high turnover, maintaining profitability, lack of infrastructure support and inefficient system. Therefore, most of the related issues that have been discussed in the FGD are the main issues occur in M&E industry which are aligned with the data survey obtained by respondents except for the high dependency on foreign labour. The high dependency on foreign labour is main issues in this industry which about 34 respondents strongly disagree.

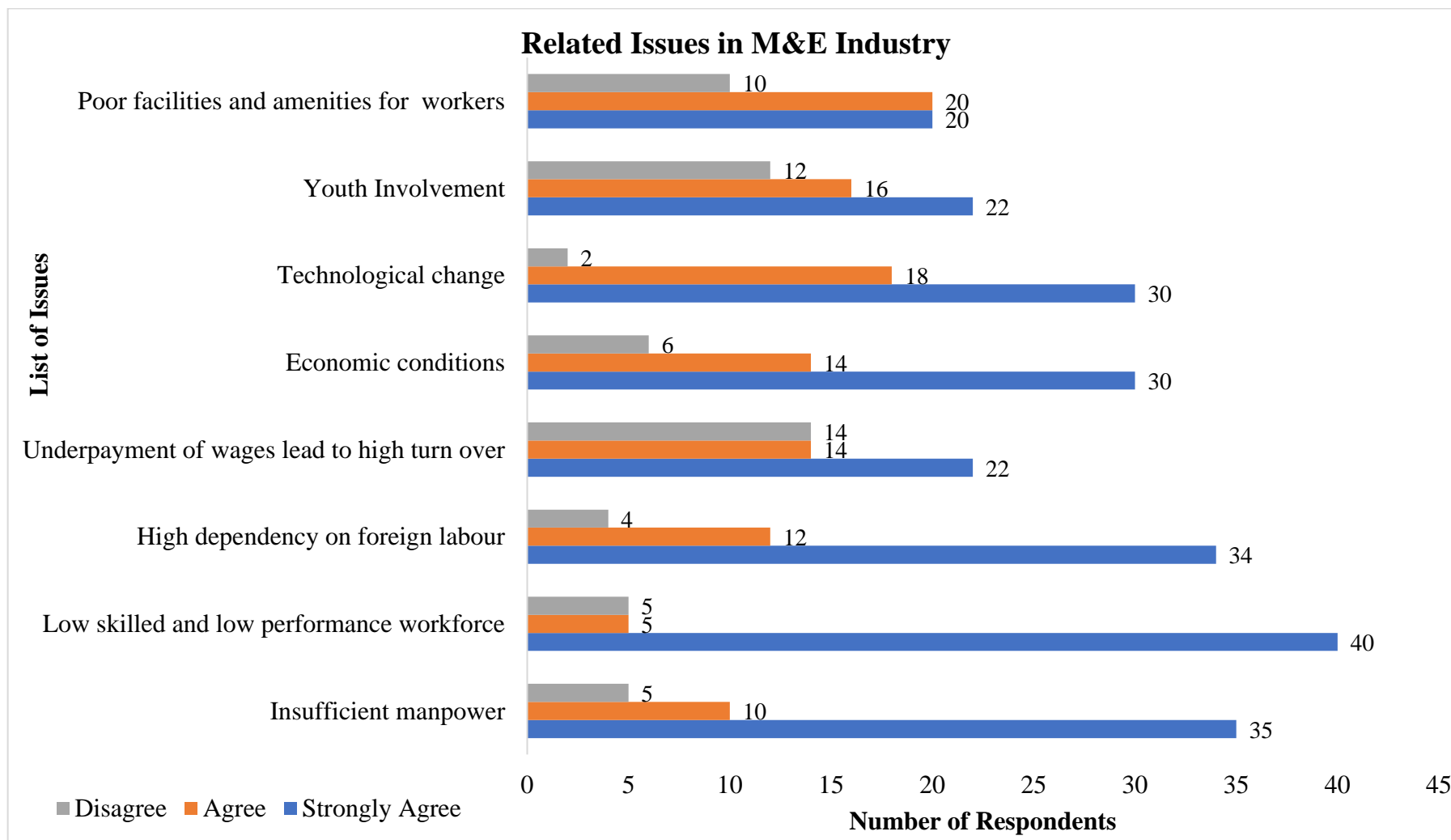


Figure 4.8: Related Issues

4.3 Comparative Study Analysis

Comparative study analysis is used to determine and quantify relationships by analysing performance on few selected countries. For this analysis, United States of America (USA), Germany and China was chosen based on their performance on M&E industry especially on their Gross Domestic Products (GDP) share for manufacturing industry.

4.3.1 International Occupational Frameworks

a) United States of America (USA)

Machinery manufacturing is one of the largest and most competitive sectors of the U.S. manufacturing economy. Exports of capital equipment totalled USD141 billion in 2018 alone. Leading markets for U.S. machinery exports include Canada, Mexico, China, Germany, and Australia. The United Kingdom, Brazil, Japan, Singapore, and Belgium round out the top 10 export markets. Taken as a whole, the European Union was the U.S. machinery manufacturers' third-largest market in 2018, after Canada and Mexico. Among the wide range of machinery manufactured in the United States, construction machinery, engine equipment, industrial process controls, agricultural equipment, and turbines and turbine generator sets led U.S. exports in 2018. Major competitors in global machinery markets include China, Germany, Japan, and Italy⁴⁷. Total GDP share for manufacturing industry in US for 2018 was recorded at 11.4% for manufacturing industry⁴⁸.

Tens of thousands of companies manufacture machinery in the United States. A majority of these manufacturers are small and medium enterprises (SMEs), but there are also many large, public companies and iconic American brands that trade on a global scale. Machinery is manufactured in almost

47 The Machinery and Equipment Industry in the United States (July 2019) Retrieved from <https://www.selectusa.gov/machinery-and-equipment-industry-united-states>

48 Percentage added to U.S. GDP 2018, by industry (July 2019) Retrieved from <https://www.statista.com/statistics/248004/percentage-added-to-the-us-gdp-by-industry/>

every state, but production is concentrated particularly in the industrial Midwest, California, and Texas.

More than 1.1 million Americans are employed in the machinery manufacturing sector. These jobs are primarily in highly-skilled, well-compensated trades and professions. Leading employment categories include team assemblers, machinists, welders, tool-and-die makers, and mechanical and other engineers. Machinery manufacturing also supports the jobs of hundreds of thousands of Americans in a variety of other manufacturing and service industries³⁴.

b) Germany

M&E in Germany is the second largest and most innovative sector in Germany. It is one of the technological motors that drive the country as a high-tech nation, and one which combines all the key feature technologies including electronics, robotics, materials and software. Germany has attracted major system integrators who are taking advantage of the outstanding conditions that the country has to offer. In 2017, mechanical and plant engineering has recorded a turnover of EUR226 billion making Germany as Europe's best performer in M&E sector⁴⁹.

M&E is Germany's largest sector by level of activity, boasting almost 6,500 companies of which nearly 90% are SME's along the value chain. The German M&E industry remains the largest industrial employer. The number of people employed in Germany M&E industry broke the million mark in 2014, rising by a further 30 thousand people through to the end of 2017. With total R&D expenditure of almost Eur 6 billion annually from 2015 to 2017, the M&E industry belongs to the most innovative sectors in Germany. The

49 The Machinery and Equipment Industry in Germany (July 2019) retrieved from https://www.gtai.de/GTAI/Content/EN/Invest/_SharedDocs/Downloads/GTAI/Industry-overviews/industry-overview-machinery-equipment-en.pdf?v=14

GDP share for manufacturing industry for 2018 was recorded at 20.83% for manufacturing industry⁵⁰.

Germany is the world's leading industry 4.0 nation. The Germany market for Industry 4.0 solutions (software, IT services, and hardware) increased from EUR4 billion in 2015 to almost EUR6 billion in 2017.

c) China

China's machinery industry is one of the leading pillars of the country's economy. Its main business revenue increased about 6.05% in 2018, reaching USD3.18 trillion in value. China's manufacturing industry recovered in 2018 with greater than expected trade exports, indicating a stable development of the world's second-largest economy. According to the data from China Customs, exports accounted for USD429 billion and imports were approximately USD202 billion from January to October in 2018, an increase of 12.1% and 19.1% respectively from 2017.⁵¹ However, the GDP share for manufacturing industry for 2018 was recorded at 29% for manufacturing industry⁵².

However, problems such as rising costs and decreasing demand still exist, putting pressure on the Chinese government to ensure the industry's stability. In the next few years, the Chinese government aims to control capital outflow to foreign industries such as real estate, sports, and entertainment while focusing on overseas investment for high tech manufacturing technology industries.

50 Germany: Share of manufacturing (July 2019) Retrieved from

https://www.theglobaleconomy.com/Germany/Share_of_manufacturing/

51 China-Machinery (July 2019) retrieved from <https://www.export.gov/article?id=China-Machinery>

52 The World Bank : Manufacturing, value added (% of GDP) (July 2019) Retrieved from

<https://data.worldbank.org/indicator/NV.IND.MANF.ZS?end=2018&start=1979>

The low-end machinery market is dominated by SMEs, mainly due to their cost-cutting structures, price-based competition, and ability to crowd out larger enterprises to some extent. Chinese machinery SMEs is mainly clustered in and around Shanghai, Shandong Province, Jiangsu Province, and Zhejiang Province. The high-end machinery market is largely composed of state-owned enterprises and international market players. These companies can differentiate their products beyond the reach and capabilities of local, smaller competitors and therefore possess significant intellectual property assets in terms of patents, licenses, and trademarks while leveraging their globally recognized brands.





According to data from the China Die Mold Industry Association, there were 2,023 enterprises in the machine tools industry in China in 2013 and employed 5000 people for the machinery and equipment industry. 959 belonged to State owned enterprises, accounting for 47.4% of the industry and employing over 500,000 people⁵³.

d) Summary of comparative analysis

Based on the Table 4.6, China shows the overall highest for GDP percentage share but lowest than Germany and Malaysia on number of establishment and employment statistics in 2018. Summary of comparison factor for the Malaysia, United of States, Germany and China are listed in Table 4.6 below.

53 China-Machinery (July 2019) retrieved from <https://www.export.gov/article?id=China-Machinery>

Table 4.6: Summary of comparative factor in 2018

	GDP PERCENTAGE SHARE (MANU- FACTURING INDUSTRY)	NUMBER OF ESTABLISHM ENT	EMPLOYME NT STATISTICS
 Malaysia	22.4%	1,940	97,734
 United States	11.4%	10,000	1.1mil
 Germany	20.83%	6,500	1mil
 China	29%	2,023	5000

The comparative analysis is based on 3 main economic areas for each nation which is the GDP percentage (%) share of the industry, the numbers of establishment (company) and the employment statistic. The GDP percentage shares for the table above is based on the Manufacturing industry for each nation as it reflects the overall industry performance for 2018.

4.4 Occupational Structure (OS)

This section provides list of job titles identified based on the discussion with the expert panel from the M&E industry. Based on discussion with development panel, there are 36 job area identified in M&E industry. Currently, the highest occupational level for all job areas are at Level 6 are for job area specialist. FGD panels agreed that the Level 7 and 8 are for top management levels and is currently non-existence in most M&E manufacturing factories in Malaysia, which commonly has less than 100 workers.

The development of the general-purpose machinery (281) and special purpose machinery (282) group (282) was discussed together. Based on the findings, the OS for the two groups was combine as both groups share the same job area and trade discipline which include mechanical, electrical, electronic, Mechatronic and other trade specialist job area that relate to the M&E sub sector.

The job title on the OS was determined based on the general and commonly used in the industry. However, the scope of the responsibilities will be determined based on the industry that they work at.

A total of 175 job titles identified related to this industry. This result is listed in the table 4.7 to table 4.13. Besides that, the summary of the finding including with the critical job title and job title related to IR4.0 are listed in Table 4.14.

Table 4.7: Group 281 & 282 Occupational Structure (1 of 7)

SECTION	(C) MANUFACTURING		
DIVISION	(28) MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.		
GROUP	(281) MANUFACTURE OF GENERAL-PURPOSE MACHINERY (282) MANUFACTURE OF SPECIAL-PURPOSE MACHINERY		
AREA	Machinery & Equipment (M&E) Design - Electrical	Machinery & Equipment (M&E) Design - Control System	Machinery & Equipment (M&E) Design - Mechanical
LEVEL 8	Not Available	Not Available	Not Available
LEVEL 7	Not Available	Not Available	Not Available
LEVEL 6	Research & Development (R&D) Lead Engineer	Research & Development (R&D) Lead Engineer	Research & Development (R&D) Lead Engineer
LEVEL 5	Research & Development (R&D) Engineer (Electrical)***	Research & Development (R&D) Engineer (Control System) ***	Research & Development (R&D) Engineer (Mechanical) ***
LEVEL 4	Research & Development (R&D) Assistant Engineer (Electrical) ***	Research & Development (R&D) Assistant Engineer (Control System) ***	Research & Development (R&D) Assistant Engineer (Mechanical) ***
LEVEL 3	Electrical Supervisor***	Electronic Supervisor**	Mechanical Supervisor***
LEVEL 2	Electrical Technician***	Electronic Technician**	Mechanical Technician***
LEVEL 1	No Level	No Level	No Level

Note: **Job Relevant to IR4.0

***Critical Job Titles and Jobs Relevant to IR4.0

Table 4.8: Group 281 & 282 Occupational Structure (2 of 7)

SECTION	(C) MANUFACTURING							
DIVISION	(28) MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.							
GROUP	(281) MANUFACTURE OF GENERAL-PURPOSE MACHINERY (282) MANUFACTURE OF SPECIAL-PURPOSE MACHINERY							
AREA	Metal Machining – Turning, Milling & Boring	Metal Machining - Grinding	Metal Machining - Honing	Computer Numerical Control (CNC) Machine Operation - Turning	Computer Numerical Control (CNC) Machine Operation – Milling & Boring	Computer Numerical Control (CNC) Machine Operation - Grinding	Special Tooling (Mould)	Special Tooling (Die)
LEVEL 8	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 7	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 6	Metal Machining Specialist	Metal Machining Specialist	Metal Machining Specialist	Metal Machining Specialist	Metal Machining Specialist	Metal Machining Specialist	Special Tooling (Mould) Specialist	Special Tooling (Die) Specialist
LEVEL 5	Metal Machining Production Engineer*	Metal Machining Production Engineer*	Metal Machining Production Engineer*	Metal Machining Production Engineer*	Metal Machining Production Engineer*	Metal Machining Production Engineer*	Special Tooling (Mould) Designer	Special Tooling (Die) Designer
LEVEL 4	Metal Machining Production Assistant Engineer*	Metal Machining Production Assistant Engineer*	Metal Machining Production Assistant Engineer*	Metal Machining Production Assistant Engineer*	Metal Machining Production Assistant Engineer*	Metal Machining Production Assistant Engineer*	Special Tooling - Mould Maker	Special Tooling - Die Maker
LEVEL 3	Metal Machining Supervisor	Metal Machining Supervisor	Metal Machining Supervisor	CNC Machine Supervisor	CNC Machine Supervisor	CNC Machine Supervisor	Machine Supervisor	Machine Supervisor
LEVEL 2	Machinist	Machinist	Machinist	CNC Machinist	CNC Machinist	CNC Machinist	Machinist	Machinist
LEVEL 1	Machine Operator (Turning, Milling, Boring)	Machine Operator (Grinding)	Machine Operator (Honing)	CNC Machine Operator (Turning)	CNC Machine Operator (Milling & Boring)	CNC Machine Operator (Grinding)	Machine Operator	Machine Operator

Note: *Critical Job Title

Table 4.9: Group 281 & 282 Occupational Structure (3 of 7)

SECTION	(C) MANUFACTURING					
DIVISION	(28) MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.					
GROUP	(281) MANUFACTURE OF GENERAL-PURPOSE MACHINERY (282) MANUFACTURE OF SPECIAL-PURPOSE MACHINERY					
AREA	Heat Treatment	Protective Coating - Blasting	Protective Coating - Painting	Protective Coating - Thermal spray	Protective Coating - Galvanising	Protective Coating - Plating
LEVEL 8	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 7	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 6	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 5	Heat Treatment Metallurgist*	Blasting & Painting Engineer	Blasting & Painting Engineer	Not Available	Not Available	Plating Engineer*
LEVEL 4	Heat Treatment Assistant Metallurgist*	Blasting & Painting Assistant Engineer	Blasting & Painting Assistant Engineer	Not Available	Not Available	Plating Assistant Engineer*
LEVEL 3	Heat Treatment Supervisor	Blasting & Painting Supervisor	Blasting & Painting Supervisor	Thermal Spray Supervisor	Galvanising Supervisor	Plating Supervisor
LEVEL 2	Heat Treatment Operator	Blasting & Painting Technician	Blasting & Painting Technician	Thermal Spray Painter	Galvanising Technician	Plating Technician
LEVEL 1	No Level	Blaster	Painter	Painter	Galviniser	Plating Operator

Note: *Critical Job Title

Table 4.10: Group 281 & 282 Occupational Structure (4 of 7)

SECTION	(C) MANUFACTURING				
DIVISION	(28) MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.				
GROUP	(281) MANUFACTURE OF GENERAL-PURPOSE MACHINERY (282) MANUFACTURE OF SPECIAL-PURPOSE MACHINERY				
AREA	M&E Fabrication, Assembly and Repair - Process Engineering	M&E Fabrication, Assembly and Repair - Industrial Engineering	M&E Fabrication, Assembly and Repair - Hydraulic	M&E Fabrication, Assembly and Repair - Pneumatic	M&E Fabrication, Assembly and Repair - Electrical
LEVEL 8	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 7	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 6	Not Available	Not Available	Hydraulic Specialist	Pneumatic Specialist	Electrical Specialist
LEVEL 5	Process Engineer	Industrial Engineer*	Hydraulic & Pneumatic Engineer	Hydraulic & Pneumatic Engineer	Electrical Engineer*
LEVEL 4	Process Assistant Engineer	Industrial Assistant Engineer*	Hydraulic & Pneumatic Assistant Engineer	Hydraulic & Pneumatic Assistant Engineer	Electrical Assistant Engineer*
LEVEL 3	Production Supervisor	Production Supervisor	Hydraulic Supervisor	Pneumatic Supervisor	Electrical Supervisor*
LEVEL 2	Production Technician	Production Technician	Hydraulic Technician	Pneumatic Technician	Electrical Technician*
LEVEL 1	No Level	No Level	No Level	No Level	No Level

Note: *Critical Job Title

Table 4.11: Group 281 & 282 Occupational Structure (5 of 7)

SECTION	(C) MANUFACTURING			
DIVISION	(28) MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.			
GROUP	(281) MANUFACTURE OF GENERAL-PURPOSE MACHINERY (282) MANUFACTURE OF SPECIAL-PURPOSE MACHINERY			
AREA	M&E Fabrication, Assembly and Repair - Electronic	M&E Fabrication, Assembly and Repair - Mechanical	M&E Fabrication, Assembly and Repair - Mechatronic	M&E Fabrication, Assembly and Repair - Automation
LEVEL 8	Not Available	Not Available	Not Available	Not Available
LEVEL 7	Not Available	Not Available	Not Available	Not Available
LEVEL 6	Electronic Specialist	Mechanical Specialist	Mechatronic Specialist	Automation Specialist
LEVEL 5	Electronic Engineer*	Mechanical Engineer*	Mechatronic Engineer	Automation Engineer
LEVEL 4	Electronic Assistant Engineer*	Mechanical Assistant Engineer*	Mechatronic Assistant Engineer	Automation Assistant Engineer
LEVEL 3	Electronic Supervisor	Mechanical Supervisor*	Mechatronic Supervisor	Automation Supervisor
LEVEL 2	Electronic Technician	Mechanical Technician*	Mechatronic Technician	Automation Technician
LEVEL 1	No Level	No Level	No Level	No Level

Note: *Critical Job Title

Table 4.12: Group 281 & 282 Occupational Structure (6 of 7)

SECTION	(C) MANUFACTURING	
DIVISION	(28) MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.	
GROUP	(281) MANUFACTURE OF GENERAL-PURPOSE MACHINERY (282) MANUFACTURE OF SPECIAL-PURPOSE MACHINERY	
AREA	Manufacture of Machinery and Equipment Quality Management - Quality Control	Manufacture of Machinery and Equipment Quality Management - Quality Assurance
LEVEL 8	Not Available	Not Available
LEVEL 7	Not Available	Not Available
LEVEL 6	Not Available	Not Available
LEVEL 5	Quality Control Engineer*	Quality Assurance Engineer*
LEVEL 4	Quality Control Assistant Engineer*	Quality Assurance Assistant Engineer*
LEVEL 3	Quality Control Supervisor	Quality Control Supervisor
LEVEL 2	Quality Control Technician	Quality Control Technician
LEVEL 1	No Level	No Level

Note: *Critical Job Title

Table 4.13: Group 281 & 282 Occupational Structure (7 of 7)

SECTION	(C) MANUFACTURING							
DIVISION	(28) MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.							
GROUP	(281) MANUFACTURE OF GENERAL-PURPOSE MACHINERY (282) MANUFACTURE OF SPECIAL-PURPOSE MACHINERY							
AREA	Robotic Engineering - Robot Design	Robotic Engineering - Integrated Robotic System Design	Robotic Engineering - Robotic Programming	Robotic Engineering - Robotic Operation Control & Maintenance	Automation System Engineering - Electrical	Automation System Engineering - Electronic	Automation System Engineering - Mechatronic	Automation System Engineering - Mechanical
LEVEL 8	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 7	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 6	Robotic Engineering Specialist**	Robotic Engineering Specialist**	Robotic Engineering Specialist**	Robotic Operation Specialist**	Electrical Automation System Specialist**	Electronic Automation System Specialist**	Mechatronic Automation System Specialist**	Mechanical Automation System Specialist**
LEVEL 5	Robot Designer***	Robotic System Design Engineer***	Robotic Programming System Analyst***	Robotic Operation Engineer***	Electrical Engineer***	Electronic Engineer***	Mechatronic Engineer***	Mechanical Engineer***
LEVEL 4	Robot Assistant Designer***	Robotic System Design Assistant Engineer***	Robotic Lead Programmer***	Robotic Operation Assistant Engineer***	Electrical Assistant Engineer***	Electronic Asst. Engineer***	Mechatronic Asst. Engineer***	Mechanical Assistant Engineer***
LEVEL 3	Robot Making Technician***	Robotic Operation Operator***	Robotic Programmer***	Robotic Operation Operator***	Electrical Supervisor***	Electronic Supervisor***	Mechanical Supervisor***	Mechatronic Supervisor***
LEVEL 2	No Level	No Level	No Level	No Level	Electrical Technician***	Electronic Technician***	Mechanical Technician***	Mechatronic Technician***
LEVEL 1	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level

Note: **Job Relevant to IR4.0

***Critical Job Titles and Jobs Relevant to IR4.0

Table 4.14: Summary of Job Titles

NO	JOB AREA	LEVEL								TOTAL IDENTIFIED JOB TITLES	TOTAL CRITICAL JOB TITLES	TOTAL JOB TITLES RELEVANT TO IR4.0
		1	2	3	4	5	6	7	8			
281 MANUFACTURE OF GENERAL-PURPOSE MACHINERY												
282 MANUFACTURE OF SPECIAL-PURPOSE MACHINERY												
1	Machinery & Equipment (M&E) Design - Electrical	NL	1	1	1	1	1	NA	NA	5	4	4
2	Machinery & Equipment (M&E) Design - Control System	NL	1	1	1	1	1	NA	NA	5	2	4
3	Machinery & Equipment (M&E) Design - Mechanical	NL	1	1	1	1	1	NA	NA	5	4	4
4	Metal Machining – Turning, Milling & Boring	1	1	1	1	1	1	NA	NA	6	2	NA
5	Metal Machining - Grinding	1	1	1	1	1	1	NA	NA	6	2	NA
6	Metal Machining - Honing	1	1	1	1	1	1	NA	NA	6	2	NA
7	Computer Numerical Control (CNC) Machine Operation - Turning	1	1	1	1	1	1	NA	NA	6	2	NA
8	Computer Numerical Control (CNC) Machine Operation – Milling & Boring	1	1	1	1	1	1	NA	NA	6	2	NA
9	Computer Numerical Control (CNC) Machine Operation - Grinding	1	1	1	1	1	1	NA	NA	6	2	NA
10	Special Tooling (Mould)	1	1	1	1	1	1	NA	NA	6	NA	NA
11	Special Tooling (Die)	1	1	1	1	1	1	NA	NA	6	NA	NA
12	Heat Treatment	NL	1	1	1	1	NA	NA	NA	4	2	NA
13	Protective Coating - Blasting	1	1	1	1	1	NA	NA	NA	5	NA	NA
14	Protective Coating - Painting	1	1	1	1	1	NA	NA	NA	5	NA	NA
15	Protective Coating - Thermal spray	1	1	1	NA	NA	NA	NA	NA	3	NA	NA
16	Protective Coating - Galvanising	1	1	1	NA	NA	NA	NA	NA	3	NA	NA
17	Protective Coating - Plating	1	1	1	1	1	NA	NA	NA	5	2	NA
18	M&E Fabrication, Assembly and Repair - Process Engineering	NL	1	1	1	1	NA	NA	NA	4	NA	NA
19	M&E Fabrication, Assembly and Repair - Industrial Engineering	NL	1	1	1	1	NA	NA	NA	4	2	NA
20	M&E Fabrication, Assembly and Repair - Hydraulic	NL	1	1	1	1	1	NA	NA	5	NA	NA
21	M&E Fabrication, Assembly and Repair - Pneumatic	NL	1	1	1	1	1	NA	NA	5	NA	NA
22	M&E Fabrication, Assembly and Repair - Electrical	NL	1	1	1	1	1	NA	NA	5	4	NA
23	M&E Fabrication, Assembly and Repair - Electronic	NL	1	1	1	1	1	NA	NA	5	2	NA

NO	JOB AREA	LEVEL								TOTAL IDENTIFIED JOB TITLES	TOTAL CRITICAL JOB TITLES	TOTAL JOB TITLES RELEVANT TO IR4.0
		1	2	3	4	5	6	7	8			
24	M&E Fabrication, Assembly and Repair - Mechanical	NL	1	1	1	1	1	NA	NA	5	4	NA
25	M&E Fabrication, Assembly and Repair - Mechatronic	NL	1	1	1	1	1	NA	NA	5	NA	NA
26	M&E Fabrication, Assembly and Repair - Automation	NL	1	1	1	1	1	NA	NA	5	NA	NA
27	Manufacture of Machinery and Equipment Quality Management - Quality Control	NL	1	1	1	1	NA	NA	NA	4	2	NA
28	Manufacture of Machinery and Equipment Quality Management - Quality Assurance	NL	1	1	1	1	NA	NA	NA	4	2	NA
29	Robotic Engineering - Robot Design	NL	NL	1	1	1	1	NA	NA	4	3	4
30	Robotic Engineering - Integrated Robotic System Design	NL	NL	1	1	1	1	NA	NA	4	3	4
31	Robotic Engineering - Robotic Programming	NL	NL	1	1	1	1	NA	NA	4	3	4
32	Robotic Engineering - Robotic Operation Control & Maintenance	NL	NL	1	1	1	1	NA	NA	4	3	4
33	Automation System Engineering - Electrical	NL	1	1	1	1	1	NA	NA	5	4	5
34	Automation System Engineering - Electronic	NL	1	1	1	1	1	NA	NA	5	4	5
35	Automation System Engineering - Mechatronic	NL	1	1	1	1	1	NA	NA	5	4	5
36	Automation System Engineering - Mechanical	NL	1	1	1	1	1	NA	NA	5	4	5
Grand Total of Identified Job Titles										175	70	48

NL – No Level

NA – Not Available

Based on the FGD session, the OS result identified the total of job titles are 175, total of critical job titles are 70 and total of job titles relevant to IR4.0 are 48 job titles.

4.5 Occupational Responsibilities

From the OS produced, each and every job titles responsibility which may include but not limited to the list were discussed with the expert from M&E industry during the FGD. This occupational responsibility are purposely for the NOSS development. The information discussed are listed in the Table 4.15 to Table 4.26.

Division: (28) Manufacture of machinery and equipment n.e.c

Group: (281) Manufacture of general-purpose machinery

(282) Manufacture of special-purpose machinery

Table 4.15: List of Responsibilities for Group 281 & 282 based on Table 4.7

AREA	Machinery & Equipment (M&E) Design - Electrical	Machinery & Equipment (M&E) Design - Control System	Machinery & Equipment (M&E) Design - Mechanical
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	<u>R&D Lead Engineer</u> 1) Create prototype environments according to customer requirements. 2) Perform root-cause analysis of defects and provide guidance for resolution and recommendations for improvement. 3) Assign priority and severity of defects.	<u>R&D Lead Engineer</u> 1) Create prototype environments according to customer requirements. 2) Perform root-cause analysis of defects and provide guidance for resolution and recommendations for improvement. 3) Assign priority and severity of defects.	<u>R&D Lead Engineer</u> 1) Create prototype environments according to customer requirements. 2) Perform root-cause analysis of defects and provide guidance for resolution and recommendations for improvement. 3) Assign priority and severity of defects.

AREA	Machinery & Equipment (M&E) Design - Electrical	Machinery & Equipment (M&E) Design - Control System	Machinery & Equipment (M&E) Design - Mechanical
	<p>4) Provide rapid hands-on support, troubleshooting, and root cause analysis of errors of automation to maximize uptime and minimize human effort required across the analytical groups.</p> <p>5) Evaluate and integrate new analytical technologies, when applicable, into workflows where there is a clear benefit to implementation.</p>	<p>4) Provide rapid hands-on support, troubleshooting, and root cause analysis of errors of automation to maximize uptime and minimize human effort required across the analytical groups.</p> <p>5) Evaluate and integrate new analytical technologies, when applicable, into workflows where there is a clear benefit to implementation.</p>	<p>4) Provide rapid hands-on support, troubleshooting, and root cause analysis of errors of automation to maximize uptime and minimize human effort required across the analytical groups.</p> <p>5) Evaluate and integrate new analytical technologies, when applicable, into workflows where there is a clear benefit to implementation.</p>
Level 5	<p><u>R&D Engineer (Electrical)</u></p> <p>1) Verify electrical system design.</p> <p>2) Verify electrical system testing and commissioning.</p> <p>3) Verify electrical documentation management.</p> <p>4) Provides relevant information and documentation to other parties on electrical system.</p> <p>5) Manage resources planning for electrical system team.</p> <p>6) Monitor in project management.</p>	<p><u>R&D Engineer (Control System)</u></p> <p>1) Determine regulatory and authority body compliance requirement.</p> <p>2) Prepare and validate quality management requirement.</p> <p>3) Prepare and evaluate product conceptual design modelling.</p> <p>4) Carry out design engineering analysis.</p> <p>5) Prepare design specification.</p> <p>6) Produce BOM list.</p> <p>7) Carry out design fabrication and assembly.</p> <p>8) Perform testing and commissioning on product design (NDT & DT).</p>	<p><u>R&D Engineer (Mechanical)</u></p> <p>1) Determine regulatory and authority body compliance requirement.</p> <p>2) Prepare and validate quality management requirement.</p> <p>3) Prepare and evaluate product conceptual design modelling.</p> <p>4) Carry out design engineering analysis.</p> <p>5) Prepare design specification.</p> <p>6) Produce BOM list.</p> <p>7) Carry out design fabrication and assembly.</p> <p>8) Perform testing and commissioning on product design (NDT & DT).</p>

AREA	Machinery & Equipment (M&E) Design - Electrical	Machinery & Equipment (M&E) Design - Control System	Machinery & Equipment (M&E) Design - Mechanical
		9) Execute fine tuning and optimisation for product design. 10) Produce final product prototyping. 11) Perform product prototype documentation management including user manuals, operating manual and maintenance manual. 12) Provide relevant information and documentation to other parties.	9) Execute fine tuning and optimisation for product design. 10) Produce final product prototyping. 11) Perform product prototype documentation management including user manuals, operating manual and maintenance manual. 12) Provide relevant information and documentation to other parties.
Level 4	<u>R&D Assistant Engineer (Electrical)</u> 1) Carry out electrical system design. 2) Carry out electrical system testing and commissioning. 3) Carry out electrical documentation management. 4) Provides relevant information and documentation to other parties on electrical system. 5) Carry out resources planning for electrical system team. 6) Assist in project management.	<u>R&D Assistant Engineer (Control System)</u> 1) Determine regulatory and authority body compliance requirement. 2) Prepare and evaluate product conceptual design modelling. 3) Carry out design engineering analysis. 4) Prepare design specification. 5) Produce BOM list.	<u>R&D Assistant Engineer (Mechanical)</u> 1) Determine regulatory and authority body compliance requirement. 2) Assist in preparing and evaluating product conceptual design modelling. 3) Assist in carrying out design engineering analysis. 4) Assist in preparing design specification. 5) Assist in preparing BOM list. 6) Carry out design fabrication and assembly. 7) Perform testing and commissioning on product design (NDT & DT). 8) Execute fine tuning and optimisation for product design.

AREA	Machinery & Equipment (M&E) Design - Electrical	Machinery & Equipment (M&E) Design - Control System	Machinery & Equipment (M&E) Design - Mechanical
			9) Assist in producing final product prototyping. 10) Assist in carrying out product prototype documentation management including user manuals, operating manual and maintenance manual. 11) Provide relevant information and documentation to other parties.
Level 3	<u>Electrical Supervisor</u> 1) Manages the electrical maintenance work force. 2) Prepare maintenance operation scheduling. 3) Ensures that all data collected regarding work process is accurate and complete when being entered into data bank. 4) Coordinate installation, maintenance and inspection tools and equipment preparation. 5) Confirm electrical component assembly. 6) Confirm functionality test result for electrical system.	<u>Electronic Supervisor</u> 1) Supervise assembling electronic components, subassemblies, products, or systems. 2) Maintains, repairs, and installs various types of electronic equipment and related devices such as electronic transmitting and receiving equipment. 3) Troubleshoots electronic equipment and system failures. 4) Assists in root cause analysis of such system failures. 5) Assist engineers in diagnosing malfunctions in machinery and equipment. 6) Generates maintenance schedules and job assignments.	<u>Mechanical Supervisor</u> 1) Inspect mechanics' repairs and installations. 2) Maintain parts inventory. 3) Ensure compliance with safety practices. 4) Evaluate mechanics work and performance. 5) Prepare maintenance operation scheduling. 6) Ensures that all data collected regarding work process is accurate and complete. 7) Coordinate installation, maintenance and inspection tools and equipment preparation. 8) Confirm mechanical component assembly.

AREA	Machinery & Equipment (M&E) Design - Electrical	Machinery & Equipment (M&E) Design - Control System	Machinery & Equipment (M&E) Design - Mechanical
	7) Prepare and coordinate preventive and corrective for machine and equipment maintenance activities. 8) Confirm machine parameter setting. 9) Perform supervisory function.	7) Interprets specifications, blueprints, and job orders to workers, and assigns duties. 8) Establishes or adjusts work procedures to meet production schedules.	9) Prepare and coordinate preventive and corrective for machine and equipment maintenance activities. 10) Confirm machine parameter setting. 11) Perform supervisory function.
Level 2	<u>Electrical Technician</u> 1) Interpret design drawing. 2) Prepare installation, maintenance and inspection tools and equipment. 3) Identify electrical component specification. 4) Carry out assembly of electrical component. 5) Carry out cable laying as per diagram. 6) Assist in testing activities for electrical system. 7) Conduct functionality test for electrical system. 8) Carry out preventive and corrective for machine and equipment maintenance. 9) Carry out machine parameter setting.	<u>Electronic Technician</u> 1) Install and assemble of electronic systems based on technical specifications. 2) Repair and maintain electronic systems as needed. 3) Operate power and manual tools safely to avoid accidents. 4) Make cable and wiring connections accurately. 5) Perform regular inspections to identify defects and replacements. 6) Perform system testing to evaluate performance and functionality. 7) Maintain inventory control of electronic components and tools. 8) Maintain documentations of system installation and maintenance procedures. 9) Recommend upgrades and modifications to improve system performance.	<u>Mechanical Technician</u> 1) Check equipment and operating systems. 2) Ensure mechanical operations, standards and controls are maintained. 3) Resolve motor, pump, conveyor and hydraulic problems. 4) Repair and perform preventive maintenance as per established standards. 5) Handle personal tools for job including up-to-date documented personal tool lists. 6) Handle time accounting and complete work order.

AREA	Machinery & Equipment (M&E) Design - Electrical	Machinery & Equipment (M&E) Design - Control System	Machinery & Equipment (M&E) Design - Mechanical
	10) Record machine operation checklist. 11) Prepare machine operation report.		
Level 1	No Level	No Level	No Level

Table 4.16: List of Responsibilities for Group 281 & 282 based on Table 4.8

AREA	Metal Machining – Turning, Milling & Boring	Metal Machining - Grinding	Metal Machining - Honing
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	<u>Metal Machining Specialist</u> 1) Identify requirements by conducting engineering studies on design for products, associated components, and structures. 2) Determine designs which can be produced by existing manufacturing or processing facilities and methods. 3) Determine feasibility of designing new plant equipment or modifying existing facilities considering costs, available space, time limitations, company planning, and other technical and economic factors. 4) Apply engineering principles to design, develop or modify design 5) Test products by analysing test data and reports to determine if design meets functional and performance specifications. 6) Prepare quotes by communicating with vendors and suppliers.	<u>Metal Machining Specialist</u> 1) Identify requirements by conducting engineering studies on design for products, associated components, and structures. 2) Determine designs which can be produced by existing manufacturing or processing facilities and methods. 3) Determine feasibility of designing new plant equipment or modifying existing facilities considering costs, available space, time limitations, company planning, and other technical and economic factors. 4) Apply engineering principles to design, develop or modify design 5) Test products by analysing test data and reports to determine if design meets functional and performance specifications. 6) Prepare quotes by communicating with vendors and suppliers.	<u>Metal Machining Specialist</u> 1) Identify requirements by conducting engineering studies on design for products, associated components, and structures. 2) Determine designs which can be produced by existing manufacturing or processing facilities and methods. 3) Determine feasibility of designing new plant equipment or modifying existing facilities considering costs, available space, time limitations, company planning, and other technical and economic factors. 4) Apply engineering principles to design, develop or modify design. 5) Test products by analysing test data and reports to determine if design meets functional and performance specifications. 6) Prepare quotes by communicating with vendors and suppliers.

AREA	Metal Machining – Turning, Milling & Boring	Metal Machining - Grinding	Metal Machining - Honing
Level 5	<u>Metal Machining Production Engineer</u> <ol style="list-style-type: none"> 1) Prepare production planning for machine operation. 2) Lead machining operation. 3) Analyse machining operation efficiency. 4) Carry out troubleshooting of machine failure. 5) Prepare maintenance planning for machine. 6) Evaluate new machine for machining operation. 7) Perform machine capability analysis. 8) Identify optimisation requirements for current machine. 9) Carry out machine load balancing. 10) Prepare SOP and method of statement for machine operation. 11) Liaise with outsourcing vendor and supplier for machine maintenance and parts purchase. 12) Develop CNC program for machine operation. 	<u>Metal Machining Production Engineer</u> <ol style="list-style-type: none"> 1) Prepare production planning for machine operation. 2) Lead machining operation. 3) Analyse machining operation efficiency. 4) Carry out troubleshooting of machine failure. 5) Prepare maintenance planning for machine. 6) Evaluate new machine for machining operation. 7) Perform machine capability analysis. 8) Identify optimisation requirements for current machine. 9) Carry out machine load balancing. 10) Prepare SOP and method of statement for machine operation. 11) Liaise with outsourcing vendor and supplier for machine maintenance and parts purchase. 12) Develop CNC program for machine operation. 	<u>Metal Machining Production Engineer</u> <ol style="list-style-type: none"> 1) Prepare production planning for machine operation. 2) Lead machining operation. 3) Analyse machining operation efficiency. 4) Carry out troubleshooting of machine failure. 5) Prepare maintenance planning for machine. 6) Evaluate new machine for machining operation. 7) Perform machine capability analysis. 8) Identify optimisation requirements for current machine. 9) Carry out machine load balancing. 10) Prepare SOP and method of statement for machine operation. 11) Liaise with outsourcing vendor and supplier for machine maintenance and parts purchase. 12) Develop CNC program for machine operation.

AREA	Metal Machining – Turning, Milling & Boring	Metal Machining - Grinding	Metal Machining - Honing
Level 4	<u>Metal Machining Production Assistant Engineer</u> <ol style="list-style-type: none"> 1) Determine parts and tools needed in order to achieve manufacturing goals. 2) Design, develop, implement, and analyses technical products and systems. 3) Perform equipment engineering design evaluations and documents results. 4) Carry out analysis to improve equipment availability and capability by utilizing continuous improvement tools and working cross functionally. 5) Implement operation and maintenance SOP for machine and equipment. 6) Validate equipment purchasing requirements. 7) Liaise with others department. 8) Setup reduction and changeovers according to product specification. 9) Recommend alterations to development and design to improve quality of products and/or procedures. 	<u>Metal Machining Production Assistant Engineer</u> <ol style="list-style-type: none"> 1) Determine parts and tools needed in order to achieve manufacturing goals. 2) Design, develop, implement, and analyses technical products and systems. 3) Perform equipment engineering design evaluations and documents results. 4) Carry out analysis to improve equipment availability and capability by utilizing continuous improvement tools and working cross functionally. 5) Implement operation and maintenance SOP for machine and equipment. 6) Validate equipment purchasing requirements. 7) Liaise with others department. 8) Setup reduction and changeovers according to product specification. 9) Recommend alterations to development and design to improve quality of products and/or procedures. 	<u>Metal Machining Production Assistant Engineer</u> <ol style="list-style-type: none"> 1) Determine parts and tools needed in order to achieve manufacturing goals. 2) Design, develop, implement, and analyses technical products and systems. 3) Perform equipment engineering design evaluations and documents results. 4) Carry out analysis to improve equipment availability and capability by utilizing continuous improvement tools and working cross functionally. 5) Implement operation and maintenance SOP for machine and equipment. 6) Validate equipment purchasing requirements. 7) Liaise with others department. 8) Setup reduction and changeovers according to product specification. 9) Recommend alterations to development and design to improve quality of products and/or procedures.

AREA	Metal Machining – Turning, Milling & Boring	Metal Machining - Grinding	Metal Machining - Honing
	10) Identify problems with product and performance and recommends solutions or enhancements. 11) Prepare project costing. 12) Lead troubleshooting activities for machine fault. 13) Prepare SOP and method of statement for machine operation. 14) Liaise with outsourcing vendor and supplier for machine maintenance and parts purchase. 15) Develop CNC program for machine operation.	10) Identify problems with product and performance and recommends solutions or enhancements. 11) Prepare project costing. 12) Lead troubleshooting activities for machine fault. 13) Prepare SOP and method of statement for machine operation. 14) Liaise with outsourcing vendor and supplier for machine maintenance and parts purchase. 15) Develop CNC program for machine operation.	10) Identify problems with product and performance and recommends solutions or enhancements. 11) Prepare project costing. 12) Lead troubleshooting activities for machine fault. 13) Prepare SOP and method of statement for machine operation. 14) Liaise with outsourcing vendor and supplier for machine maintenance and parts purchase. 15) Develop CNC program for machine operation.
Level 3	<u>Metal Machining Supervisor</u> 1) Organise and schedule the work. 2) Ensure production goals and deadline are met. 3) Review drawings for manufacturing errors and work with engineering department to correct them. 4) Monitor and make recommendations to maintain and improve efficiencies.	<u>Metal Machining Supervisor</u> 1) Organise and schedule the work. 2) Ensure production goals and deadline are met. 3) Review drawings for manufacturing errors and work with engineering department to correct them. 4) Monitor and make recommendations to maintain and improve efficiencies.	<u>Metal Machining Supervisor</u> 1) Organise and schedule the work. 2) Ensure production goals and deadline are met. 3) Review drawings for manufacturing errors and work with engineering department to correct them. 4) Monitor and make recommendations to maintain and improve efficiencies.

AREA	Metal Machining – Turning, Milling & Boring	Metal Machining - Grinding	Metal Machining - Honing
	5) Report any machine or process problems to Manager/ Maintenance. 6) Monitor job efficiencies and develop corrective action. 7) Follow and adhere by all safety guidelines established by the company.	5) Report any machine or process problems to Manager/ Maintenance. 6) Monitor job efficiencies and develop corrective action. 7) Follow and adhere by all safety guidelines established by the company.	5) Report any machine or process problems to Manager/ Maintenance. 6) Monitor job efficiencies and develop corrective action. 7) Follow and adhere by all safety guidelines established by the company.
Level 2	<u>Machinist</u> 1) Calculate dimensions and tolerances using micrometers and vernier callipers. 2) Machine parts to specifications. 3) Measure, examine, and test completed units. 4) Set up, adjust, and operate all of the basic machine tools. 5) Align and secure holding fixtures, cutting tools, attachments, accessories, and materials onto machines. 6) Monitor the feed and speed of machines during the machining process. 7) Install repaired parts into equipment, or install new equipment. 8) Clean and lubricate machines, tools, and equipment.	<u>Machinist</u> 1) Calculate dimensions and tolerances using micrometers and vernier callipers. 2) Machine parts to specifications. 3) Measure, examine, and test completed units. 4) Set up, adjust, and operate all of the basic machine tools. 5) Align and secure holding fixtures, cutting tools, attachments, accessories, and materials onto machines. 6) Monitor the feed and speed of machines during the machining process. 7) Install repaired parts into equipment, or install new equipment. 8) Clean and lubricate machines, tools, and equipment.	<u>Machinist</u> 1) Calculate dimensions and tolerances using micrometers and vernier callipers. 2) Machine parts to specifications. 3) Measure, examine, and test completed units. 4) Set up, adjust, and operate all of the basic machine tools. 5) Align and secure holding fixtures, cutting tools, attachments, accessories, and materials onto machines. 6) Monitor the feed and speed of machines during the machining process. 7) Install repaired parts into equipment, or install new equipment. 8) Clean and lubricate machines, tools, and equipment.

AREA	Metal Machining – Turning, Milling & Boring	Metal Machining - Grinding	Metal Machining - Honing
	9) Dismantle machines or equipment, using hand tools and power tools. 10) Fit and assemble parts to make or repair machine tools. 11) Set up and operate metalworking, brazing, heat-treating, welding, and cutting equipment.	9) Dismantle machines or equipment, using hand tools and power tools. 10) Fit and assemble parts to make or repair machine tools. 11) Set up and operate metalworking, brazing, heat-treating, welding, and cutting equipment.	9) Dismantle machines or equipment, using hand tools and power tools. 10) Fit and assemble parts to make or repair machine tools. 11) Set up and operate metalworking, brazing, heat-treating, welding, and cutting equipment.
Level 1	<u>Machine Operator (Turning, Milling, Boring)</u> 1) Setup machines to perform machining operations. 2) Lift workpiece manually or with hoist and clamps it in holding fixtures. 3) Move machine controls to feed tool into workpiece and engage feed. 4) Observe machine operation and verifies conformance of workpiece to specifications, using measuring instruments, such as fixed gauges, callipers, and micrometers. 5) Change worn tools according to work instruction procedures.	<u>Grinding Machine Operator</u> 1) Setup machines to perform machining operations. 2) Lift workpiece manually or with hoist and clamps it in holding fixtures. 3) Move machine controls to feed tool into workpiece and engage feed. 4) Observe machine operation and verifies conformance of workpiece to specifications, using measuring instruments, such as fixed gauges, callipers, and micrometers. 5) Change worn tools according to work instruction procedures. 6) Adjust cutting speeds, feed rates, and depth of cut.	<u>Honing Machine Operator</u> 1) Setup machines to perform machining operations. 2) Lift workpiece manually or with hoist and clamps it in holding fixtures. 3) Move machine controls to feed tool into workpiece and engage feed. 4) Observe machine operation and verifies conformance of workpiece to specifications, using measuring instruments, such as fixed gauges, callipers, and micrometers. 5) Change worn tools according to work instruction procedures. 6) Adjust cutting speeds, feed rates, and depth of cut.

AREA	Metal Machining – Turning, Milling & Boring	Metal Machining - Grinding	Metal Machining - Honing
	6) Adjust cutting speeds, feed rates, and depth of cut. 7) Assist machine setter in setting up machine.	7) Assist machine setter in setting up machine.	7) Assist machine setter in setting up machine.

Table 4.17: List of Responsibilities for Group 281 & 282 based on Table 4.8

Area	Computer Numerical Control (CNC) Machine Operation - Turning	Computer Numerical Control (CNC) Machine Operation – Milling & Boring	Computer Numerical Control (CNC) Machine Operation - Grinding
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	<u>Metal Machining Specialist</u> 1) Identify requirements by conducting engineering studies on design for products, associated components, and structures. 2) Determine designs which can be produced by existing manufacturing or processing facilities and methods. 3) Determine feasibility of designing new plant equipment or modifying existing facilities considering costs, available space, time limitations, company planning, and other technical and economic factors. 4) Apply engineering principles to design, develop or modify design. 5) Test products by analysing test data and reports to determine if design meets functional and performance specifications.	<u>Metal Machining Specialist</u> 1) Identify requirements by conducting engineering studies on design for products, associated components, and structures. 2) Determine designs which can be produced by existing manufacturing or processing facilities and methods. 3) Determine feasibility of designing new plant equipment or modifying existing facilities considering costs, available space, time limitations, company planning, and other technical and economic factors. 4) Apply engineering principles to design, develop or modify design. 5) Test products by analysing test data and reports to determine if design meets functional and performance specifications.	<u>Metal Machining Specialist</u> 1) Identify requirements by conducting engineering studies on design for products, associated components, and structures. 2) Determine designs which can be produced by existing manufacturing or processing facilities and methods. 3) Determine feasibility of designing new plant equipment or modifying existing facilities considering costs, available space, time limitations, company planning, and other technical and economic factors. 4) Apply engineering principles to design, develop or modify design. 5) Test products by analysing test data and reports to determine if design meets functional and performance specifications.

Area	Computer Numerical Control (CNC) Machine Operation - Turning	Computer Numerical Control (CNC) Machine Operation – Milling & Boring	Computer Numerical Control (CNC) Machine Operation - Grinding
	6) Prepare quotes by communicating with vendors to prepare quotes for custom tooling as necessary.	6) Prepare quotes by communicating with vendors to prepare quotes for custom tooling as necessary.	6) Prepare quotes by communicating with vendors to prepare quotes for custom tooling as necessary.
Level 5	<u>Metal Machining Production Engineer</u> 1) Prepare production planning for machine operation. 2) Lead machining operation. 3) Analyse machining operation efficiency. 4) Carry out troubleshooting of machine failure. 5) Prepare maintenance planning for machine. 6) Evaluate new machine for machining operation. 7) Perform machine capability analysis. 8) Identify optimisation requirements for current machine. 9) Carry out machine load balancing. 10) Prepare SOP and method of statement for machine operation. 11) Liaise with outsourcing vendor and supplier for machine maintenance and parts purchase.	<u>Metal Machining Production Engineer</u> 1) Prepare production planning for machine operation. 2) Lead machining operation. 3) Analyse machining operation efficiency. 4) Carry out troubleshooting of machine failure. 5) Prepare maintenance planning for machine. 6) Evaluate new machine for machining operation. 7) Perform machine capability analysis. 8) Identify optimisation requirements for current machine. 9) Carry out machine load balancing. 10) Prepare SOP and method of statement for machine operation. 11) Liaise with outsourcing vendor and supplier for machine maintenance and parts purchase.	<u>Metal Machining Production Engineer</u> 1) Prepare production planning for machine operation. 2) Lead machining operation. 3) Analyse machining operation efficiency. 4) Carry out troubleshooting of machine failure. 5) Prepare maintenance planning for machine. 6) Evaluate new machine for machining operation. 7) Perform machine capability analysis. 8) Identify optimisation requirements for current machine. 9) Carry out machine load balancing. 10) Prepare SOP and method of statement for machine operation. 11) Liaise with outsourcing vendor and supplier for machine maintenance and parts purchase.

Area	Computer Numerical Control (CNC) Machine Operation - Turning	Computer Numerical Control (CNC) Machine Operation – Milling & Boring	Computer Numerical Control (CNC) Machine Operation - Grinding
	12) Develop CNC program for machine operation.	12) Develop CNC program for machine operation.	12) Develop CNC program for machine operation.
Level 4	<u>Metal Machining Production Assistant Engineer</u> <ol style="list-style-type: none"> 1) Determine parts and tools needed in order to achieve manufacturing goals. 2) Design, develop, implement, and analyses technical products and systems. 3) Perform equipment engineering design evaluations and documents results. 4) Carry out analysis to improve equipment availability and capability by utilizing continuous improvement tools and working cross functionally. 5) Implement operation and maintenance SOP for machine and equipment. 6) Check equipment purchasing requirements. 7) Setup reduction and changeovers according to product specification. 8) Recommend alterations to development and design to improve quality of products and/or procedures. 	<u>Metal Machining Production Assistant Engineer</u> <ol style="list-style-type: none"> 1) Determine parts and tools needed in order to achieve manufacturing goals. 2) Design, develop, implement, and analyses technical products and systems. 3) Perform equipment engineering design evaluations and documents results. 4) Carry out analysis to improve equipment availability and capability by utilizing continuous improvement tools and working cross functionally. 5) Implement operation and maintenance SOP for machine and equipment. 6) Check equipment purchasing requirements 7) Setup reduction and changeovers according to product specification. 8) Recommend alterations to development and design to improve quality of products and/or procedures. 	<u>Metal Machining Production Assistant Engineer</u> <ol style="list-style-type: none"> 1) Determine parts and tools needed in order to achieve manufacturing goals. 2) Design, develop, implement, and analyses technical products and systems. 3) Perform equipment engineering design evaluations and documents results. 4) Carry out analysis to improve equipment availability and capability by utilizing continuous improvement tools and working cross functionally. 5) Implement operation and maintenance SOP for machine and equipment. 6) Check equipment purchasing requirements. 7) Setup reduction and changeovers according to product specification. 8) Recommend alterations to development and design to improve quality of products and/or procedures.

Area	Computer Numerical Control (CNC) Machine Operation - Turning	Computer Numerical Control (CNC) Machine Operation – Milling & Boring	Computer Numerical Control (CNC) Machine Operation - Grinding
	9) Identify problems with product and performance and recommends solutions or enhancements. 10) Prepare project costing. 11) Lead troubleshooting activities for machine fault. 12) Prepare SOP and method of statement for machine operation. 13) Liaise with outsourcing vendor and supplier for machine maintenance and parts purchase. 14) Develop CNC program for machine operation.	9) Identify problems with product and performance and recommends solutions or enhancements. 10) Prepare project costing. 11) Lead troubleshooting activities for machine fault. 12) Prepare SOP and method of statement for machine operation. 13) Liaise with outsourcing vendor and supplier for machine maintenance and parts purchase. 14) Develop CNC program for machine operation.	9) Identify problems with product and performance and recommends solutions or enhancements. 10) Prepare project costing. 11) Lead troubleshooting activities for machine fault. 12) Prepare SOP and method of statement for machine operation. 13) Liaise with outsourcing vendor and supplier for machine maintenance and parts purchase. 14) Develop CNC program for machine operation.
Level 3	<u>CNC Machine Supervisor</u> 1) Inspect that all HSE and operational procedures are followed and foster a clean work environment. 2) Recommend measures to improve programming, tool usage, setup, operating techniques, equipment performance, and shop layout to increase department efficiency.	<u>CNC Machine Supervisor</u> 1) Inspect that all HSE and operational procedures are followed and foster a clean work environment. 2) Recommend measures to improve programming, tool usage, setup, operating techniques, equipment performance, and shop layout to increase department efficiency.	<u>CNC Machine Supervisor</u> 1) Inspect that all HSE and operational procedures are followed and foster a clean work environment. 2) Recommend measures to improve programming, tool usage, setup, operating techniques, equipment performance, and shop layout to increase department efficiency.

Area	Computer Numerical Control (CNC) Machine Operation - Turning	Computer Numerical Control (CNC) Machine Operation – Milling & Boring	Computer Numerical Control (CNC) Machine Operation - Grinding
	3) Facilitate accurate employee reporting of material pick list, time scan, scrap rate and quality tracking data. 4) Confirm dimensional/tolerance accuracy, per blueprints and specifications, on all machined parts. 5) Establish ongoing maintenance schedule for all CNC machines, shop tools and ancillary equipment. 6) Schedule outside maintenance and repairs when needed. 7) Recommend additional staff as needed. 8) Ensure the tool crib is functioning as required and we are fully supported by the vendor.	3) Facilitate accurate employee reporting of material pick list, time scan, scrap rate and quality tracking data. 4) Confirm dimensional/tolerance accuracy, per blueprints and specifications, on all machined parts. 5) Establish ongoing maintenance schedule for all CNC machines, shop tools and ancillary equipment. 6) Schedule outside maintenance and repairs when needed. 7) Recommend additional staff as needed. 8) Ensure the tool crib is functioning as required and we are fully supported by the vendor.	3) Facilitate accurate employee reporting of material pick list, time scan, scrap rate and quality tracking data. 4) Confirm dimensional/tolerance accuracy, per blueprints and specifications, on all machined parts. 5) Establish ongoing maintenance schedule for all CNC machines, shop tools and ancillary equipment. 6) Schedule outside maintenance and repairs when needed. 7) Recommend additional staff as needed. 8) Ensure the tool crib is functioning as required and we are fully supported by the vendor.
Level 2	<u>CNC Machinist</u> 1) Plan machining operation by interpreting orders, blueprints, engineering plans, materials, specifications, orthographic drawings, reference planes, locations of surfaces, and machining parameters. 2) Interpret geometric dimensions and tolerances (GD&T).	<u>CNC Machinist</u> 1) Plan machining operation by interpreting orders, blueprints, engineering plans, materials, specifications, orthographic drawings, reference planes, locations of surfaces, and machining parameters. 2) Interpret geometric dimensions and tolerances (GD&T).	<u>CNC Machinist</u> 1) Plan machining operation by interpreting orders, blueprints, engineering plans, materials, specifications, orthographic drawings, reference planes, locations of surfaces, and machining parameters. 2) Interpret geometric dimensions and tolerances (GD&T).

Area	Computer Numerical Control (CNC) Machine Operation - Turning	Computer Numerical Control (CNC) Machine Operation – Milling & Boring	Computer Numerical Control (CNC) Machine Operation - Grinding
	3) Program mills and lathes by entering instructions. 4) Sets-up CNC machines by installing and adjusting three- and four-jaw chucks, tools, attachments, collets, bushings, cams, gears, stops, and stock pushers. 5) Load feed mechanism by lifting stock into position. 6) Confirm settings by measuring positions, first-run part and sample workpieces 7) Maintain safe operations by adhering to safety procedures and regulations. 8) Carry out preventive maintenance procedure.	3) Program mills and lathes by entering instructions. 4) Sets-up CNC machines by installing and adjusting three- and four-jaw chucks, tools, attachments, collets, bushings, cams, gears, stops, and stock pushers. 5) Load feed mechanism by lifting stock into position. 6) Confirm settings by measuring positions, first-run part and sample workpieces 7) Maintain safe operations by adhering to safety procedures and regulations. 8) Carry out preventive maintenance procedure.	3) Program mills and lathes by entering instructions. 4) Sets-up CNC machines by installing and adjusting three- and four-jaw chucks, tools, attachments, collets, bushings, cams, gears, stops, and stock pushers. 5) Load feed mechanism by lifting stock into position. 6) Confirm settings by measuring positions, first-run part and sample workpieces 7) Maintain safe operations by adhering to safety procedures and regulations. 8) Carry out preventive maintenance procedure.
Level 1	<u>CNC Machine Operator (Turning)</u> 1) Interpret engineering drawings and requirements into dimensions for production. 2) Check CNC machine operates in accordance with the guidelines of the company.	<u>CNC Machine Operator (Milling & Boring)</u> 1) Interpret engineering drawings and requirements into dimensions for production. 2) Check CNC machine operates in accordance with the guidelines of the company.	<u>CNC Machine Operator (Grinding)</u> 1) Interpret engineering drawings and requirements into dimensions for production. 2) Check CNC machine operates in accordance with the guidelines of the company.

Area	Computer Numerical Control (CNC) Machine Operation - Turning	Computer Numerical Control (CNC) Machine Operation – Milling & Boring	Computer Numerical Control (CNC) Machine Operation - Grinding
	3) Check the machines while they execute the tasks and make the necessary changes to produce improved results. 4) Check machinery on a daily basis to guarantee functionality. 5) Record all machine actions by completing production and quality logs. 6) Conduct regular CNC machine assessments.	3) Check the machines while they execute the tasks and make the necessary changes to produce improved results. 4) Check machinery on a daily basis to guarantee functionality. 5) Record all machine actions by completing production and quality logs. 6) Conduct regular CNC machine assessments.	3) Check the machines while they execute the tasks and make the necessary changes to produce improved results. 4) Check machinery on a daily basis to guarantee functionality. 5) Record all machine actions by completing production and quality logs. 6) Conduct regular CNC machine assessments.

Table 4.18: List of Responsibilities for Group 281 & 282 based on Table 4.8 & Table 4.9

AREA	Special Tooling (Mould)	Special Tooling (Die)	Heat Treatment
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	<u>Special Tooling (Mould) Specialist</u> 1) Plan, sequence and lay out work operations in the fabrication, assembly, repair, rework, routine and maintenance. 2) Inspect tools and parts meet engineering requirements, specifications and tolerances for dimension, shape, contour, location and coordination. 3) Provide tooling support to manufacturing as required. 4) Provide support within the maintenance department as required.	<u>Special Tooling (Die) Specialist</u> 1) Plan, sequence and lay out work operations in the fabrication, assembly, repair, rework, routine and maintenance. 2) Inspect tools and parts meet engineering requirements, specifications and tolerances for dimension, shape, contour, location and coordination. 3) Provide tooling support to manufacturing as required. 4) Provide support within the maintenance department as required.	Not Available
Level 5	<u>Special Tooling (Mould) Designer</u> 1) Carry out inspection on newly developed parts and tooling.	<u>Special Tooling (Die) Designer</u> 1) Carry out inspection on newly developed parts and tooling.	<u>Heat Treatment Metallurgist</u> 1) Implement heat treatment cycle and processes. 2) Validate equipment operational safety and maintenance.

AREA	Special Tooling (Mould)	Special Tooling (Die)	Heat Treatment
	2) Develop cost analysis and/or or proposals for implementation of new processes or improvements to existing processes. 3) Design forging moulds and part progressions. 4) Develop in house process prints. 5) Provide manufacturability recommendations for new parts. 6) Create work and/or gauging instructions designed. 7) Develop continuous improvement ideas. 8) Develop/optimize process flow to increase efficiency of operation. 9) Provide shop floor support trouble shooting manufacturing processes. 10) Provide engineering support.	2) Develop cost analysis and/or or proposals for implementation of new processes or improvements to existing processes. 3) Design forging dies and part progressions. 4) Develop in house process prints. 5) Provide manufacturability recommendations for new parts. 6) Create work and/or gauging instructions designed. 7) Develop continuous improvement ideas to increase tool life, operator safety and reduce manufacturing cost 8) Develop/optimize process flow to increase efficiency of operation. 9) Provide shop floor support trouble shooting manufacturing processes. 10) Provide engineering support.	3) Develop and implement maintaining method for heat treatment process. 4) Liaise with metallurgist and laboratory staff. 5) Carry out cost analysis for forging and heat treatment process. 6) Collaborate with other department to establish technology change. 7) Develop work procedure, process improvement and cost saving plan. 8) Provide consultation for material selection and treatment process. 9) Develop product and process design specification. 10) Perform SAT and uniformity check.
Level 4	<u>Special Tooling - Mould Maker</u> 1) Verify dimensions, alignment and clearances of finished parts. 2) Fit and assemble parts to make, repair or modify dies, jigs, gauges and tools. 3) Conducts test runs with completed tools or dies.	<u>Special Tooling - Die Maker</u> 1) Verify dimensions, alignment and clearances of finished parts. 2) Fit and assemble parts to make, repair or modify dies, jigs, gauges and tools. 3) Conduct test runs with completed tools or dies.	<u>Heat Treatment Assistant Metallurgist</u> 1) Assist in planning, design and writing specifications for the purchase of heat treat furnaces and tooling. 2) Troubleshoot and support all heat treat processing.

AREA	Special Tooling (Mould)	Special Tooling (Die)	Heat Treatment
	4) Inspect finished dies for smoothness, contour, conformity, and defects. 5) Build, modify and maintain dies. 6) Fabricate a wide variety of tooling and components from details. 7) Provide key trouble shooting on dies. 8) Perform routine and preventive maintenance on dies. 9) Maintain projects scheduling. 10) Assist in design of dies and tooling components. 11) Actively participates in the testing and verification of tooling. 12) Maintain records of die testing. 13) Prepare progress reports as required. 14) Document die design data for the improvement of future designs. 15) Assist in designing extrusion tooling	4) Inspect finished dies for smoothness, contour, conformity, and defects. 5) Build, modify and maintain dies. 6) Fabricate a wide variety of tooling and components from details. 7) Provide key trouble shooting on dies. 8) Perform routine and preventive maintenance on dies. 9) Maintain projects scheduling. 10) Assist in design of dies and tooling components. 11) Actively participates in the testing and verification of tooling. 12) Maintain records of die testing. 13) Prepare progress reports as required. 14) Document die design data for the improvement of future designs. 15) Assist in designing extrusion tooling.	3) Assist in planning items that need corrected on furnaces. 4) Provide analysis for purchase of new furnaces and/or heat treat equipment. 5) Benchmark heat treating technology throughout the world. 6) Develop and/or maintain preventative maintenance program.
Level 3	<u>Machining Supervisor</u> 1) Review drawings for manufacturing errors and work with engineering department to correct them. 2) Monitor job efficiencies and develop corrective action.	<u>Machining Supervisor</u> 1) Work with shop employees and plant management, to organize and schedule the work. 2) Ensure production goals and deadline are met.	<u>Heat Treatment Supervisor</u> 1) Supervise and coordinate activities of workers engaged in hardening, tempering, annealing, and other heat-treating processes.

AREA	Special Tooling (Mould)	Special Tooling (Die)	Heat Treatment
	3) Work with shop employees and plant management, to organize and schedule the work. 4) Ensure production goals and deadline are met. 5) Monitor and make recommendations to maintain and improve efficiencies. 6) Report any machine or process problems to Manager/ Maintenance.	3) Review drawings for manufacturing errors. 4) Monitor and make recommendations to maintain and improve efficiencies. 5) Report any machine or process problems to Manager/ Maintenance. 6) Monitor job efficiencies and develop corrective action.	2) Conduct metallurgical analyses on metal samples and machine tools. 3) Estimate requisitions, and inspects materials. 4) Confer with other supervisory personnel to coordinate activities of individual departments. 5) Confer with workers' representatives to resolve grievances.
Level 2	<u>Machinist</u> 1) Calculate dimensions and tolerances using micrometers and vernier callipers. 2) Machine parts to specifications. 3) Measure, examine, and test completed units. 4) Set up, adjust, and operate all of the basic machine tools. 5) Align and secure holding fixtures, cutting tools, attachments, accessories, and materials onto machines. 6) Monitor the feed and speed of machines during the machining process. 7) Install repaired parts into equipment, or install new equipment.	<u>Machinist</u> 1) Calculate dimensions and tolerances using micrometers and vernier callipers. 2) Machine parts to specifications. 3) Measure, examine, and test completed units. 4) Set up, adjust, and operate all of the basic machine tools. 5) Align and secure holding fixtures, cutting tools, attachments, accessories, and materials onto machines. 6) Monitor the feed and speed of machines during the machining process. 7) Install repaired parts into equipment, or install new equipment.	<u>Heat Treatment Operator</u> 1) Operate heat treating furnaces correctly and accurately following predetermined recipes generated by Metallurgy. 2) Maintain heat number and grade traceability. 3) Operate crane, forklift, and/or squeeze truck to transport rings between forging area, cooling area, and heat treat area, and inspection area. 4) Check pre-programmed controls and verifies heat treat program. 5) Prepare the surface of rings for hardness testing and operate testing equipment. 6) Perform light maintenance duties.

AREA	Special Tooling (Mould)	Special Tooling (Die)	Heat Treatment
	8) Clean and lubricate machines, tools, and equipment. 9) Dismantle machines or equipment, using hand tools and power tools. 10) Fit and assemble parts to make or repair machine tools. 11) Set up and operate metalworking, brazing, heat-treating, welding, and cutting equipment.	8) Clean and lubricate machines, tools, and equipment. 9) Dismantle machines or equipment, using hand tools and power tools. 10) Fit and assemble parts to make or repair machine tools. 11) Set up and operate metalworking, brazing, heat-treating, welding, and cutting equipment.	
Level 1	<u>Machine Operator</u> 1) Setup machines to perform machining operations. 2) Moves machine controls to feed tool into workpiece and engage feed. 3) Observe machine operation and verifies conformance of workpiece to specifications 4) Change worn tools, using wrenches. 5) May move controls to adjust cutting speeds, feed rates, and depth of cut. 6) Assist machine setter in setting up machine.	<u>Machine Operator</u> 1) Setup machines to perform machining operations. 2) Move machine controls to feed tool into workpiece and engage feed. 3) Observe machine operation and verifies conformance of workpiece to specifications 4) Change worn tools, using wrenches. 5) May move controls to adjust cutting speeds, feed rates, and depth of cut. 6) Assist machine setter in setting up machine.	No Level

Table 4.19: List of Responsibilities for Group 281 & 282 based on Table 4.9

AREA	Protective Coating - Blasting	Protective Coating - Painting	Protective Coating - Thermal spray
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	<u>Blasting & Painting Engineer</u> 1) Analyse paint specifications of the projects and indenting. 2) Evaluate and validate paint quality. 3) Improve paint quality and minimize paint wastage. 4) Determine methodology for surface treatment as per Safety Standards as well as ISO and OSHA standards.	<u>Blasting & Painting Engineer</u> 1) Analyse paint specifications of the projects and indenting. 2) Evaluate and validate paint quality. 3) Improve paint quality and minimize paint wastage. 4) Determine methodology for surface treatment as per Safety Standards as well as ISO and OSHA standards.	Not Available
Level 4	<u>Blasting & Painting Assistant Engineer</u> 1) Assist in analysing paint specifications of the projects and indenting. 2) Assist in evaluating and validation paint quality. 3) Improve paint quality and minimize paint wastage.	<u>Blasting & Painting Assistant Engineer</u> 1) Assist in analysing paint specifications of the projects and indenting. 2) Assist in evaluating and validation paint quality. 3) Improve paint quality and minimize paint wastage.	Not Available

AREA	Protective Coating - Blasting	Protective Coating - Painting	Protective Coating - Thermal spray
	4) Determine methodology for surface treatment as per Safety Standards as well as ISO and OSHA standards.	4) Determine methodology for surface treatment as per Safety Standards as well as ISO and OSHA standards.	
Level 3	<u>Blasting & Painting Supervisor</u> <ol style="list-style-type: none"> 1) Plan and monitor of surface preparation and painting activities. 2) Assist and coordinate with the contractor to different trades and other surface repair activities. 3) Carry out quality control for various inspection of blasting standard. 4) Monitor preparation of blasting and painting materials and equipment. 5) Perform pre-inspection of blasting standard and surface cleanliness. 6) Observe recoating interval and over coating time. 7) Observe ambient condition prior to commence blasting and painting activities. 	<u>Blasting & Painting Supervisor</u> <ol style="list-style-type: none"> 1) Plan and monitor of surface preparation and painting activities. 2) Assist and coordinate with the contractor to different trades and other surface repair activities. 3) Carry out quality control for various inspection of paint standard. 4) Monitor preparation of blasting and painting materials and equipment. 5) Perform pre-inspection of blasting standard and surface cleanliness. 6) Observe recoating interval and over coating time. 7) Observe ambient condition prior to commence blasting and painting activities. 	<u>Thermal Spray Supervisor</u> <ol style="list-style-type: none"> 1) Plan and monitor of surface preparation and painting activities. 2) Assist and coordinate with the contractor to different trades and other surface repair activities. 3) Carry out quality control for various inspection of paint standard. 4) Monitor preparation of thermal spray materials and equipment. 5) Perform pre-inspection of blasting standard and surface cleanliness. 6) Observe recoating interval and over coating time. 7) Observe ambient condition prior to commence blasting and painting activities.
Level 2	<u>Blasting & Painting Technician</u> <ol style="list-style-type: none"> 1) Develop production task and schedule. 2) Investigate paint and surface issues. 	<u>Blasting & Painting Technician</u> <ol style="list-style-type: none"> 1) Develop production task and schedule. 2) Investigate paint and surface issues. 	<u>Thermal Spray Painter</u> <ol style="list-style-type: none"> 1) Prepares, masks, and applies metal spray coatings to rebuild parts. 2) Operates thermal spray machine.

AREA	Protective Coating - Blasting	Protective Coating - Painting	Protective Coating - Thermal spray
	3) Coordinate preparation of blasting activities. 4) Provide recommendation on blasting operation requirements.	3) Coordinate preparation of blasting activities. 4) Provide recommendation on blasting operation requirements.	3) Performs equipment maintenance. 4) Estimate job quotes. 5) Perform machines sets up. 6) Perform spray, including combustion, wire arc and thermal spray functions. 7) Interpret prints and drawings. 8) Performs machine inspection.
Level 1	<u>Blaster</u> 1) Carry out blasting operation. 2) Check blasting equipment functionality. 3) Prepare blasting material. 4) Check surface quality.	<u>Painter</u> 1) Preparing painting surfaces by washing walls, repairing holes, or removing old paint. 2) Mix, match, and apply paints and other finishes to various surfaces. 3) Provide decorative and faux finishes. 4) Prepare the surrounding area by covering with cloth or plastic to prevent messes. 5) Calculate the amount of materials and time required for said project. 6) Remove fixtures such as door knobs and light switch covers. 7) Clean up supplies and replacing fixtures.	<u>Painter</u> 1) Prepare painting surfaces. 2) Mix, match, and apply paints and other finishes to various surfaces. 3) Prepare the surrounding area by covering with cloth or plastic to prevent messes. 4) Calculate the amount of materials and time required for said project. 5) Clean up supplies and replacing fixtures.

Table 4.20: List of Responsibilities for Group 281 & 282 based on Table 4.9 & Table 4.10

AREA	Protective Coating - Galvanising	Protective Coating - Plating	M&E Fabrication, Assembly and Repair - Process Engineering
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	Not Available	<p><u>Plating Engineer</u></p> <ol style="list-style-type: none"> 1) Analyse plating solutions. 2) Develop strategic plans for plating equipment maintenance. 3) Develop standards for current and future plating activities. 4) Plan and manage environmental policies, procedures, work instructions and requirements. 5) Determine process limits based on experimentation and analysis. 6) Develop new processes, methods, and layouts to increase equipment flexibility and improve manufacturing yields. 	<p><u>Process Engineer</u></p> <ol style="list-style-type: none"> 1) Evaluate manufacturing processes. 2) Develop manufacturing processes. 3) Improve manufacturing efficiency. 4) Ensure product and process quality by designing testing methods; testing finished- product and process capabilities; establishing standards; confirming manufacturing processes. 5) Provide manufacturing decision-making. 6) Prepare product and process reports. 7) Provides manufacturing engineering information. 8) Coordinate equipment and machinery maintenance and repair services. 9) Maintain product and process data base.

AREA	Protective Coating - Galvanising	Protective Coating - Plating	M&E Fabrication, Assembly and Repair - Process Engineering
Level 4	Not Available	<u>Plating Assistant Engineer</u> <ol style="list-style-type: none"> 1) Oversee and coordinate plating operation in the plant. 2) Compile plating operation data for improvement analysis. 3) Implement compliance procedure based on statutory and regulatory requirements. 4) Implement safety procedures for plating operation. 5) Coordinate maintenance requirement for machinery related to plating operation. 6) Coordinate requisition for chemical and plating materials. 	<u>Process Assistant Engineer</u> <ol style="list-style-type: none"> 1) Conduct inspections and analytical tests for production operation. 2) Resolve engineering issues based on production analysis data. 3) Prepare cost-benefit analyses. 4) Comply with codes and regulations by complying with requirements. 5) Prepare operational and testing methods and procedures and guidelines. 6) Maintain and improves product and quality and production performance. 7) Monitor supplies and inventorying stock level. 8) Prepare engineering reports.
Level 3	<u>Galvanising Supervisor</u> <ol style="list-style-type: none"> 1) Review dimension of products before galvanising operation. 2) Ensure proper surface finish of product for galvanising. 3) Visual inspection of the product after galvanizing for any defects. 4) Check zinc coating of galvanized product. 	<u>Plating Supervisor</u> <ol style="list-style-type: none"> 1) Supervise all aspects of daily operations in plating department and related waste treatment plant. 2) Schedule and monitor work flow. 3) Perform daily and weekly quality tests. 4) Maintain logs and production records. 	<u>Production Supervisor</u> <ol style="list-style-type: none"> 1) Determine daily/weekly/monthly objectives and communicate them to employees. 2) Organise workflow by assigning responsibilities and preparing schedules. 3) Oversee and coach employees.

AREA	Protective Coating - Galvanising	Protective Coating - Plating	M&E Fabrication, Assembly and Repair - Process Engineering
	5) Check dimension of product after galvanising operation to ensuring any distortion. 6) Final inspection after completion of production.	5) Perform routine maintenance on plating system and equipment.	4) Ensure the safe use of equipment and schedule regular maintenance. 5) Check production output according to specifications. 6) Submit reports on performance and progress. 7) Identify issues in efficiency and suggest improvements. 8) Train new employees on how to safely use machinery and follow procedures. 9) Enforce strict safety guidelines and company standards.
Level 2	<u>Galvanising Technician</u> 1) Develop production task and schedule. 2) Investigate surface issues. 3) Coordinate preparation of galvanising activities. 4) Provide recommendation on galvanising operation requirements.	<u>Plating Technician</u> 1) Prepare plating surfaces of all parts. 2) Prepare both large and small parts for work through masking, blasting, and cadmium plating. 3) Maintain all consumables for blasting (i.e., media, nozzles, etc). 4) Regularly empty and clean the large blast booth and all other blasters used in Plating.	<u>Production Technician</u> 1) Ensure production area is safe to work, productive and has required inventory. 2) Maintain production machines and equipment. 3) Monitor and control processes using visual observation, process data and on-line testing. 4) Identify and debug problems in processes, products, equipment and work for solution.

AREA	Protective Coating - Galvanising	Protective Coating - Plating	M&E Fabrication, Assembly and Repair - Process Engineering
		5) Assist in adding chemicals to the plating bathes to ensure proper balances are maintained. 6) Improve processes and tooling in order to streamline processes. 7) Report all equipment breakdowns.	5) Provide training to technicians on plant operations. 6) Support field personnel and engineering staff in production data management. 7) Recommend new approaches to streamline team's data management.
Level 1	<u>Galviniser</u> 1) Carry out galvanising operation. 2) Check galvanising equipment functionality. 3) Prepare galvanising material. 4) Check surface quality.	<u>Plating Operator</u> 1) Operate plating line(s) including start-ups, shutdowns and stringing up the plating line. 2) Perform in-process inspections. 3) Perform chemical maintenance on plating line. 4) Perform chemical additions to bath chemistries. 5) Perform Dumping and replenishing bath chemistries. 6) Perform mechanical maintenance on plating line.	No Level

Table 4.21: List of Responsibilities for Group 281 & 282 based on Table 4.10

AREA	M&E Fabrication, Assembly and Repair - Industrial Engineering	M&E Fabrication, Assembly and Repair - Hydraulic	M&E Fabrication, Assembly and Repair - Pneumatic
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	Not Available	<p><u>Hydraulic System Specialist</u></p> <ol style="list-style-type: none"> 1) Provide technical support in case of hydraulic equipment malfunctioning. 2) Identify problems/risks and carry out checks on the control systems/applications. 3) Assist to ensure hydraulic equipment maintained to the company standards and certifying authorities. 4) Provide technical and managing support between the hydraulic suppliers and other disciplines. 5) Attend commissioning's or commissions hydraulic installations. 6) Attend the Factory Acceptance Test (FAT) and the Site Acceptance Test (SAT). 7) Verify process diagrams, drawings and documentation. 	<p><u>Pneumatic System Specialist</u></p> <ol style="list-style-type: none"> 1) Provide technical support in case of pneumatic equipment malfunctioning. 2) Identify problems/risks and carry out checks on the control systems/applications 3) Assist to ensure that the hydraulic equipment is being maintained to the company standards and the certifying authorities. 4) Provide technical and managing support between the pneumatic suppliers and other disciplines. 5) Attend commissioning's or commissions pneumatic installations in consultation with the relevant people. 6) Attend the Factory Acceptance Test (FAT) and the Site Acceptance Test (SAT). 7) Verify process diagrams, drawings and documentation.

AREA	M&E Fabrication, Assembly and Repair - Industrial Engineering	M&E Fabrication, Assembly and Repair - Hydraulic	M&E Fabrication, Assembly and Repair - Pneumatic
Level 5	<u>Industrial Engineer</u> <ol style="list-style-type: none"> 1) Review production information. 2) Design control systems. 3) Create system and plan production. 4) Develop standards for production and design. 5) Review production schedules, engineering specifications, process flows, and other information. 6) Plan operation for manufacture parts or products. 7) Develop management control systems. 8) Enact quality control procedures to resolve production problems or minimize costs. 9) Develop standards for design and production. 10) Design control systems to coordinate activities and production planning. 	<u>Hydraulic & Pneumatic Engineer</u> <ol style="list-style-type: none"> 1) Prepare all procurement specifications and prepare all technical procedures. 2) Perform research on new technology to develop new products. 3) Provide assistance to prepare hydraulic & pneumatic prototype. 4) Prepare drafts for all engineering projects and recommend change proposals. 5) Monitor efficient working of all hydraulic and pneumatic equipment. 6) Perform troubleshooting and provide support to all process engineers and make required adjustments. 7) Analyse all equipment designs and recommend improvement. 8) Evaluate all performance requirements according to customer specifications. 9) Prepare designs of hydraulic equipment. 	<u>Hydraulic & Pneumatic Engineer</u> <ol style="list-style-type: none"> 1) Prepare all procurement specifications and prepare all technical procedures. 2) Perform research on new technology to develop new products. 3) Provide assistance to prepare hydraulic & pneumatic prototype. 4) Prepare drafts for all engineering projects and recommend change proposals. 5) Monitor efficient working of all hydraulic and pneumatic equipment. 6) Perform troubleshooting and provide support to all process engineers. 7) Analyse all equipment designs and recommend improvement. 8) Evaluate all performance requirements according to customer specifications. 9) Prepare designs of hydraulic equipment.

AREA	M&E Fabrication, Assembly and Repair - Industrial Engineering	M&E Fabrication, Assembly and Repair - Hydraulic	M&E Fabrication, Assembly and Repair - Pneumatic
Level 4	<u>Industrial Assistant Engineer</u> <ol style="list-style-type: none"> 1) Perform analytic tests, collecting and analysing data. 2) Provide problem solution. 3) Perform a cost-benefit analysis for each project. 4) Ensure safety and effectiveness. 5) Conduct inspections and safety test. 6) Prepare production schedules. 7) Assist in developing management controls system. 8) Assist in design control systems. 9) Coordinate operation for manufacture parts or products. 10) Assist in develop standards for design and production. 	<u>Hydraulic & Pneumatic Assistant Engineer</u> <ol style="list-style-type: none"> 1) Monitor hydraulic and pneumatic equipment operation. 2) Assist in preparing all procurement specifications, technical procedures and bill of materials. 3) Compile data for new technology to develop new products. 4) Monitor hydraulic and pneumatic maintenance operation. 5) Provide support to all process engineers. 6) Carry out adjustments for hydraulic and pneumatic equipment. 7) Assist in analysing all equipment designs. 8) Conduct troubleshooting for hydraulic and pneumatic equipment malfunction. 9) Provide solution for hydraulic and pneumatic equipment breakdown. 	<u>Pneumatic & Pneumatic Assistant Engineer</u> <ol style="list-style-type: none"> 1) Monitor hydraulic and pneumatic equipment operation. 2) Assist in preparing all procurement specifications, technical procedures and bill of materials. 3) Compile data for new technology to develop new products. 4) Monitor hydraulic and pneumatic maintenance operation. 5) Provide support to process engineers. 6) Carry out adjustments for hydraulic and pneumatic equipment. 7) Assist in analysing all equipment designs. 8) Conduct troubleshooting for hydraulic and pneumatic equipment malfunction. 9) Provide solution for hydraulic and pneumatic equipment breakdown.
Level 3	<u>Production Supervisor</u> <ol style="list-style-type: none"> 1) Determine daily/weekly/monthly objectives and communicate them to employees. 2) Check the safe use of equipment and schedule regular maintenance. 	<u>Hydraulic Supervisor</u> <ol style="list-style-type: none"> 1) Check tools, equipment and component for assembly work. 2) Determine instructions and working procedure. 3) Comply with company safety, rules & regulations. 	<u>Pneumatic Supervisor</u> <ol style="list-style-type: none"> 1) Supervise repairing pneumatic components in the facilities or outside. 2) Supervise assembling fabricated parts at floor stations. 3) Supervise testing and calibration parts and mechanisms.

AREA	M&E Fabrication, Assembly and Repair - Industrial Engineering	M&E Fabrication, Assembly and Repair - Hydraulic	M&E Fabrication, Assembly and Repair - Pneumatic
	<ul style="list-style-type: none"> 3) Check production output according to specifications. 4) Submit reports on performance and progress. 5) Identify issues in efficiency and suggest improvements. 6) Train new employees on how to safely use machinery and follow procedures. 7) Enforce strict safety guidelines and company standards. 	<ul style="list-style-type: none"> 4) Supervise assembly works. 5) Determine technical findings at progress capture form. 6) Supervise installation works, repair works and maintaining hydraulic equipment and machinery. 7) Supervise maintenance activities. 8) Check test units for performing equipment tests. 9) Check tests procedures and results. 10) Diagnose and troubleshoot component defects. 11) Supervise corrective action activities. 12) Liaise with relevant department. 	<ul style="list-style-type: none"> 4) Check units that fail tests or tolerance levels and repairs. 5) Keep updated on technological advancements in the area.
Level 2	<u>Production Technician</u> <ul style="list-style-type: none"> 1) Check production area is safe to work, productive and has required inventory. 2) Maintain production machines and equipment. 3) Monitor and control processes using visual observation, process data and on-line testing. 	<u>Hydraulic Technician</u> <ul style="list-style-type: none"> 1) Prepare tools, equipment and component for assembly work. 2) Determine instructions and working procedure. 3) Comply with company safety, rules & regulations. 4) Carry out assembly works. 5) Identify technical findings at progress capture form. 	<u>Pneumatic Technician</u> <ul style="list-style-type: none"> 1) Repair pneumatic components in the facilities or outside. 2) Assemble fabricated parts at floor stations. 3) Use hand tools and power tools for assembling. 4) Test and calibrate parts and mechanisms to meet product specifications. 5) Identify units that fail tests or tolerance levels and repairs.

AREA	M&E Fabrication, Assembly and Repair - Industrial Engineering	M&E Fabrication, Assembly and Repair - Hydraulic	M&E Fabrication, Assembly and Repair - Pneumatic
	4) Identify and debug problems in processes, products, equipment and work for solution. 5) Resolve practical problems and deal with variety of concrete situation variables where limited standardization exists. 6) Provide training to technicians on plant operations. 7) Support field personnel and engineering staff in production data management. 8) Recommend new approaches to streamline team's data management.	6) Support cost reductions program counter measure for assembly hydraulic. 7) Install, repair and maintain hydraulic equipment and machinery. 8) Carry out maintenance activities. 9) Set up test units for performing equipment tests. 10) Record tests procedures and results. 11) Ensure the project follows established guidelines. 12) Diagnostically troubleshoot component defects. 13) Carry out corrective action. 14) Report any safety, risk or paper discrepancies to superior.	6) Keep updated on technological advancements in the area.
Level 1	No Level	No Level	No Level

Table 4.22: List of Responsibilities for Group 281 & 282 based on Table 4.10 & Table 4.11

AREA	M&E Fabrication, Assembly and Repair - Electrical	M&E Fabrication, Assembly and Repair - Electronic	M&E Fabrication, Assembly and Repair - Mechanical
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	<u>Electrical Specialist</u> 1) Develop, design, coordinate, and lead installation and maintenance activities. 2) Research issues, analyse consumption and energy data. 3) Develop countermeasures for downtime incidents. 4) Provide technical direction. 5) Troubleshoot problems, propose countermeasures, and resolve issues. 6) Develop and oversee preventative maintenance plans. 7) Assist in maintaining spare parts for electrical systems and equipment. 8) Design new installation as needed for replacement of old equipment. 9) Support and/or lead continuous improvement activities in regard to new technologies and energy savings.	<u>Electronic Specialist</u> 1) Develop, design, coordinate, and lead installation and maintenance activities. 2) Research issues, analyse consumption and energy data. 3) Develop countermeasures for downtime incidents. 4) Provide technical direction. 5) Troubleshoot problems, propose countermeasures, and resolve issues. 6) Develop and oversee preventative maintenance plans. 7) Assist in maintaining spare parts for electronic systems and equipment. 8) Design new installation as needed for replacement of old equipment. 9) Support and/or lead continuous improvement activities in regard to new technologies and energy savings.	<u>Mechanical Specialist</u> 1) Develop, design, coordinate, and lead activities in the installation and maintenance of mechanical system equipment and distribution systems including supporting production equipment as requested by departments/shops. 2) Research issues, analyse consumption and energy data, and develop countermeasures for downtime incidents. 3) Provide technical direction and support to identify and troubleshoot problems, propose countermeasures, and resolve issues. 4) Development and oversee preventative maintenance plans. 5) Assist in maintaining spare parts for mechanical systems and equipment.

AREA	M&E Fabrication, Assembly and Repair - Electrical	M&E Fabrication, Assembly and Repair - Electronic	M&E Fabrication, Assembly and Repair - Mechanical
	10) Provide technical training to Team Members as needed.	10) Provide technical training to Team Members as needed.	6) Design new installation as needed for replacement of old equipment. 7) Support and/or lead continuous improvement activities in regard to new technologies and energy savings. 8) Provide technical training to Team Members as needed.
Level 5	<u>Electrical Engineer</u> 1) Schedule and undertake periodic maintenance on all electrical equipment, components, and installations. 2) Provide prompt response to inquiries whenever there is a breakdown, and resolve the issue as quickly as possible. 3) Perform installation of fresh electrical components and fittings. 4) Recommend replacement for old or faulty electrical components or fittings to the management. 5) Assist in forecasting requirements, creating a budget and scheduling expenses for the electrical system.	<u>Electronic Engineer</u> 1) Schedule and undertake periodic maintenance on all electronic and control system, equipment, components, and installations. 2) Provide prompt response to inquiries whenever there is a breakdown, and resolve the issue as quickly as possible. 3) Perform installation of fresh electronic components and fittings. 4) Recommend replacement for old or faulty electronic components or fittings to the management. 5) Assist in forecasting requirements, creating a budget and scheduling expenses for the electronic and control system.	<u>Mechanical Engineer</u> 1) Prepare and evaluate product specification including material specification, BOM list and design drawing. 2) Determine machine operation requirements and machining process. 3) Carry out resources planning for production requirements including for method, manpower and machinery & equipment. 4) Carry out machine parameter setting according to product specification. 5) Carry out machining activities. 6) Plan CNC machine operation. 7) Identify process improvement requirement.

AREA	M&E Fabrication, Assembly and Repair - Electrical	M&E Fabrication, Assembly and Repair - Electronic	M&E Fabrication, Assembly and Repair - Mechanical
	6) Keep record of all stock and supplies, including company's electrical equipment. 7) Perform energy audit and recommend alternative sources of energy. 8) Troubleshoot machine breakdowns and provide preventive maintenance services.	6) Keep record of all stock and supplies, including company's electrical equipment. 7) Perform energy audit and recommend alternative sources of energy. 8) Troubleshoot machine breakdowns and provide preventive maintenance services.	8) Conduct Overall Equipment Effectiveness (OEE) analysis. 9) Carry out Factory Acceptance Test (FAT) and Site Acceptance Test (SAT) based on determined requirements.
Level 4	<u>Electrical Assistant Engineer</u> 1) Assist electrical engineer in installation and maintenances of electrical systems. 2) Provide administrative assistance. 3) Identify action items and work with the engineering team to close them. 4) Work with the engineering team to plan, coordinate and execute electrical projects. 5) Review project specifications and identify technical constraints and requirements. 6) Prepare technical design documents based on project specifications. 7) Identify electrical system integration and design issues. 8) Monitor and report project status to management on regular basis.	<u>Electronic Assistant Engineer</u> 1) Assist electronic engineer in installation and maintenances of electronic and control systems. 2) Provide administrative assistance. 3) Identify action items and work with the engineering team to close them. 4) Work with the engineering team to plan, coordinate and execute electrical projects. 5) Review project specifications and identify technical constraints and requirements. 6) Prepare technical design documents based on project specifications. 7) Identify electronic and control system integration and design issues. 8) Monitor and report project status to management on regular basis.	<u>Mechanical Assistant Engineer</u> 1) Assist mechanical engineer in installation and maintenances of mechanical systems. 2) Provide administrative assistance. 3) Identify action items and work with the engineering team to close them. 4) Work with the engineering team to plan, coordinate and execute mechanical projects. 5) Review project specifications and identify technical constraints and requirements. 6) Prepare technical design documents based on project specifications. 7) Identify mechanical system integration and design issues. 8) Monitor and report project status to management on regular basis.

AREA	M&E Fabrication, Assembly and Repair - Electrical	M&E Fabrication, Assembly and Repair - Electronic	M&E Fabrication, Assembly and Repair - Mechanical
	9) Supervise project activities to ensure timely completion. 10) Check project deliverables meet quality standards and customer specifications. 11) Provide technical guidance to project team when needed. 12) Schedule routine maintenance and inspection of electrical systems. 13) Develop preventive maintenance programs for electrical systems. 14) Ensure that system breakdowns, failures and repairs are addressed promptly.	9) Supervise project activities to ensure timely completion. 10) Check project deliverables meet quality standards and customer specifications. 11) Provide technical guidance to project team when needed. 12) Schedule routine maintenance and inspection of electrical systems. 13) Develop preventive maintenance programs for electrical systems. 14) Ensure that system breakdowns, failures and repairs are addressed promptly.	9) Supervise project activities to ensure timely completion. 10) Check project deliverables meet quality standards and customer specifications. 11) Provide technical guidance to project team when needed. 12) Schedule routine maintenance and inspection of mechanical systems. 13) Develop preventive maintenance programs for mechanical systems. 14) Ensure that system breakdowns, failures and repairs are addressed promptly.
Level 3	<u>Electrical Supervisor</u> 1) Manage the electrical maintenance work force. 2) Prepare maintenance operation scheduling. 3) Ensure that all data collected regarding work process is accurate and complete when being entered into data bank. 4) Coordinate installation, maintenance and inspection tools and equipment preparation. 5) Confirm electrical component assembly.	<u>Electronic Supervisor</u> 1) Supervise assembling electronic components, subassemblies, products, or systems. 2) Maintain, repair, and install various types of electronic equipment and related devices such as electronic transmitting and receiving equipment. 3) Troubleshoot electronic equipment and system failures. 4) Assist in root cause analysis of such system failures.	<u>Mechanical Supervisor</u> 1) Inspect mechanics' repairs and installations. 2) Maintain parts inventory. 3) Ensure compliance with safety practices. 4) Evaluate mechanics work and performance. 5) Prepare maintenance operation scheduling. 6) Ensure that all data collected regarding work process is accurate and complete.

AREA	M&E Fabrication, Assembly and Repair - Electrical	M&E Fabrication, Assembly and Repair - Electronic	M&E Fabrication, Assembly and Repair - Mechanical
	<ul style="list-style-type: none"> 6) Confirm functionality test result for electrical system. 7) Prepare and coordinate preventive and corrective for machine and equipment maintenance activities. 8) Confirm machine parameter setting. 9) Perform supervisory function. 	<ul style="list-style-type: none"> 5) Assist engineers in diagnosing malfunctions in machinery and equipment. 6) Generate maintenance schedules and job assignments. 7) Interpret specifications, blueprints, and job orders to workers, and assigns duties. 8) Establish or adjusts work procedures to meet production schedules. 	<ul style="list-style-type: none"> 7) Coordinate installation, maintenance and inspection tools and equipment preparation. 8) Confirm mechanical component assembly. 9) Prepare and coordinate preventive and corrective for machine and equipment maintenance activities. 10) Confirm machine parameter setting. 11) Perform supervisory function.
Level 2	<u>Electrical Technician</u> <ul style="list-style-type: none"> 1) Interpret design drawing. 2) Prepare installation, maintenance and inspection tools and equipment. 3) Identify electrical component specification. 4) Carry out assembly of electrical component. 5) Carry out cable laying as per diagram. 6) Assist in testing activities for electrical system. 7) Conduct functionality test for electrical system. 	<u>Electronic Technician</u> <ul style="list-style-type: none"> 1) Install and assemble of electronic systems based on technical specifications. 2) Repair and maintain electronic systems as needed. 3) Operate power and manual tools safely to avoid accidents. 4) Make cable and wiring connections accurately. 5) Perform regular inspections to identify defects and replacements. 6) Perform system testing to evaluate performance and functionality. 7) Maintain inventory control of electronic components and tools. 	<u>Mechanical Technician</u> <ul style="list-style-type: none"> 1) Check equipment and operating systems. 2) Ensure mechanical operations, standards and controls are maintained. 3) Resolve motor, pump, conveyor and hydraulic problems. 4) Repair and perform preventive maintenance as per established standards. 5) Handle personal tools for job including up-to-date documented personal tool lists. 6) Handle time accounting and complete work order.

AREA	M&E Fabrication, Assembly and Repair - Electrical	M&E Fabrication, Assembly and Repair - Electronic	M&E Fabrication, Assembly and Repair - Mechanical
	8) Carry out preventive and corrective for machine and equipment maintenance. 9) Carry out machine parameter setting. 10) Record machine operation checklist. 11) Prepare machine operation report.	8) Maintain documentations of system installation and maintenance procedures. 9) Recommend upgrades and modifications to improve system performance.	
Level 1	No Level	No Level	No Level

Table 4.23: List of Responsibilities for Group 281 & 282 based on Table 4.11 & Table 4.12

AREA	M&E Fabrication, Assembly and Repair - Mechatronic	M&E Fabrication, Assembly and Repair - Automation	Manufacture of Machinery and Equipment Quality Management - Quality Control
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	<u>Mechatronic System Specialist</u> <ol style="list-style-type: none"> 1) Develop, design, coordinate, and lead installation and maintenance activities. 2) Research issues, analyse consumption and energy data, and develop countermeasures for downtime incidents. 3) Provide technical direction and support. 4) Identify and troubleshoot problems, propose countermeasures, and resolve issues. 5) Develop and monitor preventative maintenance plans. 6) Assist in maintaining spare parts for mechanical and electronic systems and equipment. 7) Design new installation as needed for replacement of old equipment. 8) Support and/or lead continuous improvement activities in regard to new technologies and energy savings. 	<u>Automation Specialist</u> <ol style="list-style-type: none"> 1) Develop, design, coordinate, and lead installation and maintenance activities. 2) Research issues, analyse consumption and energy data, and develop countermeasures for downtime incidents. 3) Provide technical direction and support. 4) Identify and troubleshoot problems, propose countermeasures, and resolve issues. 5) Develop and monitor preventative maintenance plans. 6) Assist in maintaining spare parts for automation systems and equipment. 7) Design new installation as needed for replacement of old equipment. 8) Support and/or lead continuous improvement activities in regard to new technologies and energy savings. 9) Provide technical training to Team Members as needed. 	Not Available

AREA	M&E Fabrication, Assembly and Repair - Mechatronic	M&E Fabrication, Assembly and Repair - Automation	Manufacture of Machinery and Equipment Quality Management - Quality Control
	9) Provide technical training to Team Members as needed.		
Level 5	<u>Mechatronic Engineer</u> <ol style="list-style-type: none"> 1) Execute reliable electro-mechanical processes. 2) Execute reliable computer control systems for manufacturing equipment. 3) Integrate electrical and mechanical systems to enhance manufacturing systems. 4) Develop new electro-mechanical concepts for new product lines. 5) Draft and document programs for electro-mechanical and test systems. 6) Develop programming logic for manufacturing equipment. 7) Design and execute new electro-mechanical systems for new product lines. 8) Develop and test mechanical devices for high throughput laboratory automation use. 9) Manufacture and assemble new equipment with manufacturing group. 10) Create software and procedures to control automated lab equipment. 	<u>Automation Engineer</u> <ol style="list-style-type: none"> 1) Assist in designing, building and sustaining of manufacturing cells and workbenches with automation in mind. 2) Lead in designing, building and sustaining electrical elements and controls of manufacturing equipment. 3) Assist in designing, building and sustaining production test equipment. 4) Initiating opportunities for automation of manufacturing equipment. 5) Conduct equipment design reviews and provide design guidance to team and suppliers. 6) Provide on-site support during machine build, debug and testing/qualification. 7) Supervise installation and testing to verify requirements and specifications are met. 8) Develop qualification protocols and support production and test equipment qualification activities. 	<u>Quality Control Engineer</u> <ol style="list-style-type: none"> 1) Create and maintaining the Company's Quality Standards. 2) Develop, implement and maintain the Company's quality documentation, such as quality procedures, reports etc. 3) Establishing, implementing and maintaining the quality awareness throughout the various departments. 4) Work with cross-functional teams to generate Manufacturing Inspection Test Plans. 5) Inspect to ensure that products and processes comply with requirements, using established engineering techniques. 6) Conduct audits, creating audits finding reports and determine proper corrective and preventive actions. 7) Analyse the root causes and implement corrective actions for processes or parts.

AREA	M&E Fabrication, Assembly and Repair - Mechatronic	M&E Fabrication, Assembly and Repair - Automation	Manufacture of Machinery and Equipment Quality Management - Quality Control
Level 4	<u>Mechatronic Assistant Engineer</u> <ol style="list-style-type: none"> 1) Assist mechatronic engineer in installation and maintenances of electronic and control systems. 2) Provide administrative assistance 3) Identify action items and work with the engineering team to close them. 4) Work with the engineering team to plan, coordinate and execute mechatronic projects. 5) Review project specifications and identify technical constraints and requirements. 6) Prepare technical design documents based on project specifications. 7) Identify mechatronic system integration and design issues. 8) Monitor and report project status to management on regular basis. 9) Supervise project activities to ensure timely completion. 10) Ensure project deliverables meet quality standards and customer specifications. 11) Provide technical guidance to project team when needed. 	<u>Automation Assistant Engineer</u> <ol style="list-style-type: none"> 1) Assist mechatronic engineer in installation and maintenances of electronic and control systems. 2) Provide administrative assistance 3) Identify action items and work with the engineering team to close them. 4) Work with the engineering team to plan, coordinate and execute mechatronic projects. 5) Review project specifications and identify technical constraints and requirements. 6) Prepare technical design documents based on project specifications. 7) Identify mechatronic system integration and design issues. 8) Monitor and report project status to management on regular basis. 9) Supervise project activities to ensure timely completion. 10) Ensure project deliverables meet quality standards and customer specifications. 11) Provide technical guidance to project team when needed. 	<u>Quality Control Assistant Engineer</u> <ol style="list-style-type: none"> 1) Perform product incoming material inspection. 2) Carry out product in-process line inspection. 3) Carry out product secondary process inspection. 4) Execute product sampling and testing 5) Analyse product inspection verification report. 6) Implement product documentation and control. 7) Implement quality management implementation and control procedure.

AREA	M&E Fabrication, Assembly and Repair - Mechatronic	M&E Fabrication, Assembly and Repair - Automation	Manufacture of Machinery and Equipment Quality Management - Quality Control
	12) Schedule routine maintenance and inspection of mechatronic systems. 13) Develop preventive maintenance programs for mechatronic systems. 14) Ensure that system breakdowns, failures and repairs are addressed promptly.	12) Schedule routine maintenance and inspection of mechatronic systems. 13) Develop preventive maintenance programs for mechatronic systems. 14) Ensure that system breakdowns, failures and repairs are addressed promptly.	
Level 3	<u>Mechatronic Supervisor</u> 1) Inspect mechatronic component repairs and installations. 2) Maintain parts inventory. 3) Ensure compliance with safety practices. 4) Evaluate mechatronic system performance. 5) Prepare maintenance operation scheduling. 6) Ensures that all data collected regarding work process is accurate and complete. 7) Coordinate installation, maintenance and inspection tools and equipment preparation. 8) Confirm mechatronic component assembly. 9) Prepare and coordinate preventive and corrective for machine and equipment maintenance activities. 10) Confirm machine parameter setting. 11) Perform supervisory function.	<u>Automation Supervisor</u> 1) Supervise assembling of automation components, subassemblies, products, or systems. 2) Maintain, repair, and install various types of automation system component. 3) Troubleshoot equipment and system failures. 4) Assists in root cause analysis for automation system failures. 5) Produce maintenance schedules and job assignments. 6) Interpret specifications, blueprints, and job orders to workers, and assigns duties. 7) Prepare work procedures to meet production schedules.	<u>Quality Control Supervisor</u> 1) Carry out direct audit activities commensurate to production schedules. 2) Establish priorities and ensure maximum usage of assigned resources. 3) Develop monthly reports showing inspection and audit performance and improvement opportunities. 4) Evaluate and recommend alternative auditing procedures for continuous improvement. 5) Support production leads and operators for interpretation and methods following set standards. 6) Interpret and support quality policies and implement guidelines. 7) Develop and maintain QA programs complementary. 8) Supervise and review corrective solutions and prevent action claims.

AREA	M&E Fabrication, Assembly and Repair - Mechatronic	M&E Fabrication, Assembly and Repair - Automation	Manufacture of Machinery and Equipment Quality Management - Quality Control
			9) Interpret quality control system to people within organisation. .
Level 2	<u>Mechatronic Technician</u> <ol style="list-style-type: none"> 1) Identify trouble areas. 2) Determine corrective action. 3) Suggest and implements equipment improvements to increase operational efficiency. 4) Maintain appropriate level of technical and professional skills by attending training classes, seminars, exhibits, and trade shows as needed. 5) Adjust and/or installs special functional parts of machines, devices and control instruments. 6) Repair or replaces defective automation and machinery parts. 7) Assembly individual components through to complete systems or special machines in accordance with drawings. 	<u>Automation Technician</u> <ol style="list-style-type: none"> 1) Interpret electrical schematics and user manuals. 2) Improve process issues with automation software. 3) Troubleshoot hardware issues with PLCs and touchscreens. 4) Use advanced network troubleshooting to diagnose control networking issues. 5) Classify and facilitate process and automation improvements. 6) Provide support to electrical technicians. 7) Administer, backup and organise all automation related documentation. 	<u>Quality Control Inspector</u> <ol style="list-style-type: none"> 1) Perform final inspection by following documented work instructions. 2) Perform visual inspection of optical parts. 3) Perform dimensional measurements with manual/hand gauges (callipers, micrometres, etc.). 4) Identify and report systematic and preventable non-conformance occurrences. 5) Reject defective product and document through company reporting process. 6) Work with production to actively and urgently find continuous improvement opportunities.
Level 1	No Level	No Level	No Level

Table 4.24: List of Responsibilities for Group 281 & 282 based on Table 4.12 & Table 4.13

AREA	Manufacture of Machinery and Equipment Quality Management - Quality Assurance	Robotic Engineering - Robot Design	Robotic Engineering - Integrated Robotic System Design
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	Not Available	<u>Robotic Engineering Specialist</u> 1) Develop, design, coordinate, and lead activities in the robotic design. 2) Research for new technology in robotics. 3) Provide technical direction and support to identify and troubleshoot problems, propose countermeasures, and resolve issues for robotic system. 4) Create new idea on implementation of robotics application to increase efficiency. 5) Provide technical support for robotic system integration 6) Support and/or lead continuous improvement activities in regard to new technologies in automation and robotic system.	<u>Robotic Engineering Specialist</u> 1) Develop, design, coordinate, and lead activities in the robotic design. 2) Research for new technology in robotics. 3) Provide technical direction and support to identify and troubleshoot problems, propose countermeasures, and resolve issues for robotic system. 4) Create new idea on implementation of robotics application to increase efficiency. 5) Provide technical support for robotic system integration 6) Support and/or lead continuous improvement activities in regard to new technologies in automation and robotic system.
Level 5	<u>Quality Assurance Engineer</u> 1) Develop and implement a quality production program to ensure conformity	<u>Robot Designer</u> 1) Prepare and evaluate robot mechanical, electrical and electronic. 2) Produce robot modelling design.	<u>Robotic System Design Engineer</u> 1) Analyse automation and robotic system integration requirements.

AREA	Manufacture of Machinery and Equipment Quality Management - Quality Assurance	Robotic Engineering - Robot Design	Robotic Engineering - Integrated Robotic System Design
	<p>of purchased material and final products to quality standards.</p> <ol style="list-style-type: none"> 2) Maintain a high level of customer service by investigating and correcting issues and complaints relating to quality. 3) Analyse statistical data and product specifications to determine standards that meet quality and reliability expectancy of finished products. 4) Revise and update the quality control manual to incorporate statistical control programs. 5) Work closely with vendors, customers, quality representatives, and company personnel to maximise product reliability and minimize costs. 6) Develop and maintain a supplier quality index, utilizing statistical control programs, to assure that only high-quality vendors are retained. 7) Prepare for and represent the company during all audits. 8) Coordinate and approve all sample submissions of new products and engineering changes. 9) Prepare all necessary reports as required by customers and staff personnel. 	<ol style="list-style-type: none"> 3) Produce Electrical & Electronic Circuit Design and Electrical & Electronic Layout and Wiring Diagram Design. 4) Carry out engineering, electrical and electronic system analysis. 5) Produce design specification. 6) Produce BOM list. 7) Prepare product prototyping. 8) Compile and collect design documentation. 	<ol style="list-style-type: none"> 2) Perform automation and robotic system integration. 3) Perform robotic system program development verification. 4) Perform robotic system program integration. 5) Perform Human Machine Interface (HMI) development. 6) Perform autonomous module robotic programming.

AREA	Manufacture of Machinery and Equipment Quality Management - Quality Assurance	Robotic Engineering - Robot Design	Robotic Engineering - Integrated Robotic System Design
	10) Design, develop, and implement quality control training programs for all quality control staff. 11) Supervise quality control team leads and workers to ensure high productivity and product integrity throughout the production cycle. 12) Provide support and expertise to quality control teams.		
Level 4	<u>Quality Assurance Assistant Engineer</u> 1) Responsible for quality assurance for plastic production involving all products and processes. 2) Implement the quality management strategy and plans. 3) Promote quality achievement and performance improvement. 4) Set quality assurance compliance objectives and ensuring that targets are achieved. 5) Ensure compliance requirements with national and international standards and legislation are met. 6) Define quality procedures in conjunction with operations and production. 7) Determine relevant quality-related training needs.	<u>Robot Assistant Designer</u> 1) Integrate robotics with peripherals, such as welders, controllers, or other equipment. 2) Make system device lists or event timing charts. 3) Investigate mechanical failures or unexpected maintenance problems. 4) Design end-of-arm tooling. 5) Analyse and evaluate robotic systems or prototypes. 6) Install, calibrate, operate, or maintain robots. 7) Conduct research on robotic technology to create new robotic systems or system capabilities. 8) Build, configure, and test robots. 9) Document robotic application development, maintenance, or changes.	<u>Robotic System Design Assistant Engineer</u> 1) Perform design robotic mechanical system. 2) Perform design robotic sensory system design. 3) Produce robotic safety system design. 4) Produce robotic monitoring & control system design. 5) Analyse robotic communication protocol identification and integration. 6) Perform robot design integration.

AREA	Manufacture of Machinery and Equipment Quality Management - Quality Assurance	Robotic Engineering - Robot Design	Robotic Engineering - Integrated Robotic System Design
	8) Collate and analyse performance data and charts against defined parameters. 9) Ensure tests and procedures are properly understood, carried out and evaluated 10) Work with customers' auditors and ensures the execution of corrective action and compliance with customers' specifications. 11) Monitor performance through gathering relevant data and producing statistical reports. 12) Monitor data from measurement devices and initiates corrective action based on data analysis 13) Perform related audit related to production operation.	10) Provide technical support for robotic systems.	
Level 3	<u>Quality Control Supervisor</u> 1) Carry out direct audit activities commensurate to production schedules. 2) Establish priorities and ensure maximum usage of assigned resources. 3) Develop monthly reports showing inspection and audit performance and improvement opportunities. 4) Evaluate and recommend alternative auditing procedures for continuous improvement.	<u>Robotic Making Technician</u> 1) Install new robotic systems in stationary positions or on tracks. 2) Modify computer-controlled robot movements. 3) Build or assemble robotic devices or systems. 4) Develop robotic path motions to maximise efficiency, safety, and quality. 5) Maintain service records of robotic equipment or automated production systems.	<u>Robotic Operation Operator</u> 1) Install new robotic systems in stationary positions or on tracks. 2) Modify computer-controlled robot movements. 3) Build or assemble robotic devices or systems. 4) Develop robotic path motions to maximize efficiency, safety, and quality. 5) Maintain service records of robotic equipment or automated production systems.

AREA	Manufacture of Machinery and Equipment Quality Management - Quality Assurance	Robotic Engineering - Robot Design	Robotic Engineering - Integrated Robotic System Design
	<ul style="list-style-type: none"> 5) Support production leads and operators for interpretation and methods following set standards. 6) Interpret and support quality policies and implement guidelines. 7) Develop and maintain QA programs complementary 8) Supervise and review corrective solutions and prevent action claims. 9) Interpret quality control system to people within organisation. 	<ul style="list-style-type: none"> 6) Fabricate housings, jigs, fittings, or fixtures, using metalworking machines. 7) Attach wires between controllers. 8) Assist engineers in the design, configuration, or application of robotic systems. 9) Perform preventive or corrective maintenance on robotic systems or components. 10) Train customers or other personnel to install, use, or maintain robots. 11) Align, fit, or assemble component parts using hand tools, power tools, fixtures, templates, or microscopes. 12) Install, program, or repair programmable controllers, robot controllers, end-of-arm tools, or conveyors. 13) Disassemble and reassemble robots or peripheral equipment to make repairs such as replacement of defective circuit boards, sensors, controllers, encoders, and servomotors. 14) Evaluate the efficiency and reliability of industrial robotic system. 15) Operate robots to perform customized tasks. 	<ul style="list-style-type: none"> 6) Fabricate housings, jigs, fittings, or fixtures, using metalworking machines. 7) Attach wires between controllers. 8) Assist engineers in the design, configuration, or application of robotic systems. 9) Perform preventive or corrective maintenance on robotic systems or components. 10) Train customers or other personnel to install, use, or maintain robots. 11) Align, fit, or assemble component parts using hand tools, power tools, fixtures, templates, or microscopes. 12) Install, program, or repair programmable controllers, robot controllers, end-of-arm tools, or conveyors. 13) Disassemble and reassemble robots or peripheral equipment to make repairs such as replacement of defective circuit boards, sensors, controllers, encoders, and servomotors. 14) Evaluate the efficiency and reliability of industrial robotic system. 15) Operate robots to perform customized tasks.

AREA	Manufacture of Machinery and Equipment Quality Management - Quality Assurance	Robotic Engineering - Robot Design	Robotic Engineering - Integrated Robotic System Design
Level 2	<u>Quality Control Inspector</u> 1) Perform final inspection by following documented work instructions. 2) Perform visual inspection of optical parts. 3) Perform dimensional measurements with manual/hand gauges (callipers, micrometres, etc.). 4) Identify and report systematic and preventable non-conformance occurrences. 5) Reject defective product and document through company reporting process 6) Work with production to actively and urgently find continuous improvement opportunities.	No Level	No Level
Level 1	No Level	No Level	No Level

Table 4.25: List of Responsibilities for Group 281 & 282 based on Table 4.13

AREA	Robotic Engineering - Robotic Programming	Robotic Engineering - Robotic Operation Control & Maintenance	Automation System Engineering - Electrical
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	<u>Robotic Engineering Specialist</u> <ol style="list-style-type: none"> 1) Develop, design, coordinate, and lead activities in the robotic design. 2) Research for new technology in robotics. 3) Provide technical direction and support to identify and troubleshoot problems, propose countermeasures, and resolve issues for robotic system. 4) Create new idea on implementation of robotics application to increase efficiency. 5) Provide technical support for robotic system integration. 6) Support and/or lead continuous improvement activities in regard to new technologies in automation and robotic system. 	<u>Robotic Engineering Specialist</u> <ol style="list-style-type: none"> 1) Develop, design, coordinate, and lead activities in the robotic design. 2) Research for new technology in robotics. 3) Provide technical direction and support to identify and troubleshoot problems, propose countermeasures, and resolve issues for robotic system. 4) Create new idea on implementation of robotics application to increase efficiency. 5) Provide technical support for robotic system integration. 6) Support and/or lead continuous improvement activities in regard to new technologies in automation and robotic system. 	<u>Electrical Specialist</u> <ol style="list-style-type: none"> 1) Develop, design, coordinate, and lead activities in the installation and maintenance of electrical system equipment and distribution systems for automation system including supporting production equipment as requested by departments/shops. 2) Research issues, analyse consumption and energy data, and develop countermeasures for downtime incidents. 3) Provide technical direction and support to identify and troubleshoot problems, propose countermeasures, and resolve issues. 4) Development and oversee preventative maintenance plans. 5) Assist in maintaining spare parts for electrical systems and equipment.

AREA	Robotic Engineering - Robotic Programming	Robotic Engineering - Robotic Operation Control & Maintenance	Automation System Engineering - Electrical
			6) Design new installation as needed for replacement of old equipment. 7) Support and/or lead continuous improvement activities in regard to new technologies and energy savings. 8) Provide technical training to Team Members as needed.
Level 5	<u>Robotic Programming System Analyst</u> 1) Perform autonomous module robotic programming. 2) Develop human machine interface (HMI). 3) Execute robotic system program integration. 4) Perform verification of robotic system program development. 5) Verify robotic system calibration. 6) Perform robotic motion programming. 7) Perform robotic vision programming. 8) Perform robotic special function programming. 9) Carry out robotic peripherals program integration.	<u>Robotic Operation Engineer</u> 1) Assist in designing, building and sustaining of manufacturing cells. 2) Initiating opportunities for robotic system equipment to reduce waste and increase efficiency. 3) Conduct equipment design reviews and provide input guidance to robotic design team. 4) Manage day to day robotic operation in the plant. 5) Supervise installation and testing to verify requirements and specifications are met. 6) Coordinate maintenance requirement for robotic system based on determined operation guidelines.	<u>Electrical Engineer</u> 1) Schedule and undertake periodic maintenance on all electrical equipment, components, and installations. 2) Provide prompt response to inquiries whenever there is a breakdown, and resolve the issue as quickly as possible. 3) Perform installation of fresh electrical components and fittings. 4) Recommend replacement for old or faulty electrical components or fittings to the management. 5) Assist in forecasting requirements, creating a budget and scheduling expenses for the electrical system.

AREA	Robotic Engineering - Robotic Programming	Robotic Engineering - Robotic Operation Control & Maintenance	Automation System Engineering - Electrical
			6) Keep record of all stock and supplies, including company's electrical equipment. 7) Perform energy audit and recommend alternative sources of energy. 8) Troubleshoot machine breakdowns and provide preventive maintenance services.
Level 4	<u>Robotic Lead Programmer</u> 1) Carry out robotic system calibration. 2) Perform robotic motion programming. 3) Carry out robotic vision programming. 4) Carry out robotic special function programming. 5) Carry out robotic peripherals program integration.	<u>Robotic Operation Assistant Engineer</u> 1) Assist in designing, building and sustaining of manufacturing cells. 2) Initiate opportunities for robotic system equipment to reduce waste and increase efficiency. 3) Conduct equipment design reviews and provide input guidance to robotic design team. 4) Manage day to day robotic operation in the plant. 5) Supervise installation and testing to verify requirements and specifications are met. 6) Coordinate maintenance requirement for robotic system based on determined operation guidelines.	<u>Electrical Assistant Engineer</u> 1) Assist electrical engineer in installation and maintenances of electrical systems. 2) Provide administrative assistance. 3) Identify action items and work with the engineering team to close them. 4) Work with the engineering team to plan, coordinate and execute electrical projects. 5) Review project specifications and identify technical constraints and requirements. 6) Prepare technical design documents based on project specifications. 7) Identify electrical system integration and design issues. 8) Monitor and report project status to management on regular basis.

AREA	Robotic Engineering - Robotic Programming	Robotic Engineering - Robotic Operation Control & Maintenance	Automation System Engineering - Electrical
			9) Supervise project activities to ensure timely completion. 10) Ensure project deliverables meet quality standards and customer specifications. 11) Provide technical guidance to project team when needed. 12) Schedule routine maintenance and inspection of electrical systems. 13) Develop preventive maintenance programs for electrical systems. 14) Ensure that system breakdowns, failures and repairs are addressed promptly.
Level 3	<u>Robotic Programmer</u> 1) Install new robotic systems in stationary positions or on tracks. 2) Modify computer-controlled robot movements. 3) Build or assemble robotic devices or systems. 4) Develop robotic path motions to maximize efficiency, safety, and quality. 5) Maintain service records of robotic equipment or automated production systems.	<u>Robotic Operation Operator</u> 1) Install new robotic systems in stationary positions or on tracks. 2) Modify computer-controlled robot movements. 3) Build or assemble robotic devices or systems. 4) Develop robotic path motions to maximize efficiency, safety, and quality. 5) Maintain service records of robotic equipment or automated production systems.	<u>Electrical Supervisor</u> 1) Manages the electrical maintenance work force. 2) Prepare maintenance operation scheduling. 3) Ensures that all data collected regarding work process is accurate and complete when being entered into data bank. 4) Coordinate installation, maintenance and inspection tools and equipment preparation. 5) Verify electrical component assembly.

AREA	Robotic Engineering - Robotic Programming	Robotic Engineering - Robotic Operation Control & Maintenance	Automation System Engineering - Electrical
	<ul style="list-style-type: none"> 6) Fabricate housings, jigs, fittings, or fixtures, using metalworking machines. 7) Attach wires between controllers. 8) Assist engineers in the design, configuration, or application of robotic systems. 9) Perform preventive or corrective maintenance on robotic systems or components. 10) Train customers or other personnel to install, use, or maintain robots. 11) Align, fit, or assemble component parts using hand tools, power tools, fixtures, templates, or microscopes. 12) Install, program, or repair programmable controllers, robot controllers, end-of-arm tools, or conveyors. 13) Disassemble and reassemble robots or peripheral equipment to make repairs such as replacement of defective circuit boards, sensors, controllers, encoders, and servomotors. 14) Evaluate the efficiency and reliability of industrial robotic system. 15) Operate robots to perform customised tasks. 	<ul style="list-style-type: none"> 6) Fabricate housings, jigs, fittings, or fixtures, using metalworking machines. 7) Attach wires between controllers. 8) Assist engineers in the design, configuration, or application of robotic systems. 9) Perform preventive or corrective maintenance on robotic systems or components. 10) Train customers or other personnel to install, use, or maintain robots. 11) Align, fit, or assemble component parts using hand tools, power tools, fixtures, templates, or microscopes. 12) Install, program, or repair programmable controllers, robot controllers, end-of-arm tools, or conveyors. 13) Disassemble and reassemble robots or peripheral equipment to make repairs such as replacement of defective circuit boards, sensors, controllers, encoders, and servomotors. 14) Evaluate the efficiency and reliability of industrial robotic system. 15) Operate robots to perform customised tasks. 	<ul style="list-style-type: none"> 6) Verify functionality test result for electrical system. 7) Prepare and coordinate preventive and corrective for machine and equipment maintenance activities. 8) Verify machine parameter setting. 9) Perform supervisory function.

AREA	Robotic Engineering - Robotic Programming	Robotic Engineering - Robotic Operation Control & Maintenance	Automation System Engineering - Electrical
Level 2	No Level	No Level	<u>Electrical Technician</u> 1) Interpret design drawing. 2) Prepare installation, maintenance and inspection tools and equipment. 3) Identify electrical component specification. 4) Carry out assembly of electrical component. 5) Carry out cable laying as per diagram. 6) Assist in testing activities for electrical system. 7) Conduct functionality test for electrical system. 8) Carry out preventive and corrective for machine and equipment maintenance. 9) Carry out machine parameter setting. 10) Record machine operation checklist. 11) Prepare machine operation report.
Level 1	No Level	No Level	No Level

Table 4.26: List of Responsibilities for Group 281 & 282 based on Table 4.13

AREA	Automation System Engineering - Electronic	Automation System Engineering - Mechatronic	Automation System Engineering - Mechanical
Level 8	Not Available	Not Available	Not Available
Level 7	Not Available	Not Available	Not Available
Level 6	<u>Electronic Specialist</u> 1) Develop, design, coordinate, and lead activities in the installation and maintenance of electronic system equipment and distribution systems including supporting production equipment as requested by departments/shops. 2) Research issues, analyse consumption and energy data, and develop countermeasures for downtime incidents. 3) Provide technical direction and support to identify and troubleshoot problems, propose countermeasures, and resolve issues. 4) Development and oversee preventative maintenance plans. 5) Assist in maintaining spare parts for electronic systems and equipment.	<u>Mechatronic System Specialist</u> 1) Develop, design, coordinate, and lead activities in the installation and maintenance of mechanical and electronic system equipment and distribution systems including supporting production equipment as requested by departments/shops. 2) Research issues, analyse consumption and energy data, and develop countermeasures for downtime incidents. 3) Provide technical direction and support to identify and troubleshoot problems, propose countermeasures, and resolve issues. 4) Development and oversee preventative maintenance plans. 5) Assist in maintaining spare parts for mechanical and electronic systems and equipment.	<u>Mechanical Specialist</u> 1) Develop, design, coordinate, and lead activities in the installation and maintenance of mechanical system equipment and distribution systems including supporting production equipment as requested by departments/shops. 2) Research issues, analyse consumption and energy data, and develop countermeasures for downtime incidents. 3) Provide technical direction and support to identify and troubleshoot problems, propose countermeasures, and resolve issues. 4) Development and oversee preventative maintenance plans. 5) Assist in maintaining spare parts for mechanical systems and equipment.

AREA	Automation System Engineering - Electronic	Automation System Engineering - Mechatronic	Automation System Engineering - Mechanical
	6) Design new installation as needed for replacement of old equipment. 7) Support and/or lead continuous improvement activities in regard to new technologies and energy savings. 8) Provide technical training to Team Members as needed.	6) Design new installation as needed for replacement of old equipment. 7) Support and/or lead continuous improvement activities in regard to new technologies and energy savings. 8) Provide technical training to Team Members as needed.	6) Design new installation as needed for replacement of old equipment. 7) Support and/or lead continuous improvement activities in regard to new technologies and energy savings. 8) Provide technical training to Team Members as needed.
Level 5	<u>Electronic Engineer</u> 1) Schedule and undertake periodic maintenance on all electronic and control system, equipment, components, and installations. 2) Provide prompt response to inquiries whenever there is a breakdown, and resolve the issue as quickly as possible 3) Perform installation of fresh electronic components and fittings. 4) Recommend replacement for old or faulty electronic components or fittings to the management. 5) Assist in forecasting requirements, creating a budget and scheduling expenses for the electronic and control system.	<u>Mechatronic Engineer</u> 1) Execute reliable electro-mechanical processes. 2) Execute reliable computer control systems for manufacturing equipment. 3) Integrate electrical and mechanical systems to enhance manufacturing systems. 4) Develop new electro-mechanical concepts for new product lines. 5) Draft and document programs for electro-mechanical and test systems. 6) Develop programming logic for manufacturing equipment. 7) Design and execute new electro-mechanical systems for new product lines. 8) Develop and test mechanical devices for high throughput laboratory automation use.	<u>Mechanical Engineer</u> 1) Prepare and evaluate product specification including material specification, BOM list and design drawing 2) Determine machine operation requirements and machining process 3) Carry out resources planning for production requirements including for method, manpower and machinery & equipment 4) Carry out machine parameter setting according to product specification 5) Carry out machining activities 6) Plan CNC machine operation 7) Identify process improvement requirement

AREA	Automation System Engineering - Electronic	Automation System Engineering - Mechatronic	Automation System Engineering - Mechanical
	6) Keep record of all stock and supplies, including company's electrical equipment. 7) Perform energy audit and recommend alternative sources of energy. 8) Troubleshoot machine breakdowns and provide preventive maintenance services.	9) Manufacture and assemble new equipment with manufacturing group. 10) Create software and procedures to control automated lab equipment.	8) Conduct Overall Equipment Effectiveness (OEE) analysis. 9) Carry out Factory Acceptance Test (FAT) and Site Acceptance Test (SAT) based on determined requirements.
Level 4	<u>Electronic Assistant Engineer</u> 1) Assist electronic engineer in installation and maintenances of electronic and control systems. 2) Provide administrative assistance 3) Identify action items and work with the engineering team to close them. 4) Work with the engineering team to plan, coordinate and execute electrical projects. 5) Review project specifications and identify technical constraints and requirements. 6) Prepare technical design documents based on project specifications. 7) Identify electronic and control system integration and design issues 8) Monitor and report project status to management on regular basis.	<u>Mechatronic Assistant Engineer</u> 1) Assist mechatronic engineer in installation and maintenances of electronic and control systems. 2) Provide administrative assistance 3) Identify action items and work with the engineering team to close them. 4) Work with the engineering team to plan, coordinate and execute mechatronic projects. 5) Review project specifications and identify technical constraints and requirements. 6) Prepare technical design documents based on project specifications. 7) Identify mechatronic system integration and design issues.	<u>Mechanical Assistant Engineer</u> 1) Assist mechanical engineer in installation and maintenances of mechanical systems. 2) Provide administrative assistance 3) Identify action items and work with the engineering team to close them. 4) Work with the engineering team to plan, coordinate and execute mechanical projects. 5) Review project specifications and identify technical constraints and requirements. 6) Prepare technical design documents based on project specifications. 7) Identify mechanical system integration and design issues. 8) Monitor and report project status to management on regular basis.

AREA	Automation System Engineering - Electronic	Automation System Engineering - Mechatronic	Automation System Engineering - Mechanical
	9) Supervise project activities to ensure timely completion. 10) Ensure project deliverables meet quality standards and customer specifications. 11) Provide technical guidance to project team when needed. 12) Schedule routine maintenance and inspection of electrical systems. 13) Develop preventive maintenance programs for electrical systems. 14) Ensure that system breakdowns, failures and repairs are addressed promptly.	8) Monitor and report project status to management on regular basis. 9) Supervise project activities to ensure timely completion. 10) Ensure project deliverables meet quality standards and customer specifications. 11) Provide technical guidance to project team when needed. 12) Schedule routine maintenance and inspection of mechatronic systems. 13) Develop preventive maintenance programs for mechatronic systems. 14) Ensure that system breakdowns, failures and repairs are addressed promptly.	9) Supervise project activities to ensure timely completion. 10) Ensure project deliverables meet quality standards and customer specifications. 11) Provide technical guidance to project team when needed. 12) Schedule routine maintenance and inspection of mechanical systems. 13) Develop preventive maintenance programs for mechanical systems. 14) Ensure that system breakdowns, failures and repairs are addressed promptly.
Level 3	<u>Electronic Supervisor</u> 1) Supervise assembling electronic components, subassemblies, products, or systems. 2) Maintains, repairs, and installs various types of electronic equipment and related devices such as electronic transmitting and receiving equipment. 3) Troubleshoots electronic equipment and system failures.	<u>Mechatronic Supervisor</u> 1) Inspect mechatronic component repairs and installations. 2) Maintain parts inventory. 3) Ensure compliance with safety practices. 4) Evaluate mechatronic system performance. 5) Prepare maintenance operation scheduling. 6) Ensures that all data collected regarding work process is accurate and complete.	<u>Mechanical Supervisor</u> 1) Inspect mechanics' repairs and installations. 2) Maintain parts inventory. 3) Ensure compliance with safety practices. 4) Evaluate mechanics work and performance. 5) Prepare maintenance operation scheduling.

AREA	Automation System Engineering - Electronic	Automation System Engineering - Mechatronic	Automation System Engineering - Mechanical
	4) Assists in root cause analysis of such system failures. 5) Assist engineers in diagnosing malfunctions in machinery and equipment. 6) Generates maintenance schedules and job assignments. 7) Interprets specifications, blueprints, and job orders to workers, and assigns duties. 8) Establishes or adjusts work procedures to meet production schedules.	7) Coordinate installation, maintenance and inspection tools and equipment preparation. 8) Confirm mechatronic component assembly. 9) Prepare and coordinate preventive and corrective for machine and equipment maintenance activities. 10) Confirm machine parameter setting. 11) Perform supervisory function.	6) Ensures that all data collected regarding work process is accurate and complete. 7) Coordinate installation, maintenance and inspection tools and equipment preparation. 8) Confirm mechanical component assembly. 9) Prepare and coordinate preventive and corrective for machine and equipment maintenance activities. 10) Confirm machine parameter setting. 11) Perform supervisory function.
Level 2	<u>Electronic Technician</u> 1) Install and assemble of electronic systems based on technical specifications. 2) Repair and maintain electronic systems as needed. 3) Operate power and manual tools safely to avoid accidents. 4) Make cable and wiring connections accurately. 5) Perform regular inspections to identify defects and replacements. 6) Perform system testing to evaluate performance and functionality.	<u>Mechatronic Technician</u> 1) Identify trouble areas. 2) Determine corrective action 3) Suggest and implements equipment improvements to increase operational efficiency 4) Maintain appropriate level of technical and professional skills by attending training classes, seminars, exhibits, and trade shows as needed 5) Adjust and/or installs special functional parts of machines, devices and control instruments	<u>Mechanical Technician</u> 1) Check equipment and operating systems. 2) Ensure mechanical operations, standards and controls are maintained. 3) Resolve motor, pump, conveyor and hydraulic problems. 4) Repair and perform preventive maintenance as per established standards. 5) Handle personal tools for job including up-to-date documented personal tool lists. 6) Handle time accounting and complete work order.

AREA	Automation System Engineering - Electronic	Automation System Engineering - Mechatronic	Automation System Engineering - Mechanical
	7) Maintain inventory control of electronic components and tools. 8) Maintain documentations of system installation and maintenance procedures. 9) Recommend upgrades and modifications to improve system performance.	6) Repair or replaces defective automation and machinery parts 7) Assembly individual components through to complete systems or special machines in accordance with drawings	
Level 1	No Level	No Level	No Level

4.6 Mapping OS vs Available NOSS

This section provides a mapping of OS and available NOSS according to NOSS Registry 2019. The list of developed NOSS from current NOSS registry (as stated in table 2.8) was not include in the proposed OS as the area doesn't match the scope under 281 & 282. The development of the OF is based on the definition of M&E sector as agreed by the industry which focusing on the designing and manufacturing of machinery and equipment.

The current NOSS identified under 281 & 282 must be reviewed to determine the suitable area based on MSIC 2008 document. A total of 19 available NOSS identified and mapping over with the OS developed are from various division and group that can be classified under this group as shows at Table 4.27. The result of the mapping are listed in the table 4.28 to Table 4.34.

Table 4.27: List of NOSS Developed from other division relevant to Division 28

(Source: NOSS Registry January 2019)

MSIC GROUP	CORRESPONDING NOSS/ LEVEL
C259 Manufacture of other fabricated metal products; metal working service activities	1) MC-050-2:2012 Machining Operation 2) MC-050-3:2015 Machining Operation 3) MC-050-4:2012 Manufacturing Coordination (CAD/CAM) 4) MC-050-5:2012 Manufacturing Management (CAD/CAM) 5) MC-031-3:2015 Metal Stamping Die Making 6) MC-031-4:2013 Metal Stamping Die Manufacturing Technology 7) MC-031-5:2013 Metal Stamping Die Management 8) MC-071-3:2014 Industrial Heat Treatment Operation
F433 Building completion and finishing	1) F433-004-2:2018 Blasting and Painting Operation 2) F433-004-3:2018 Blasting and Painting Operation Supervision

MSIC GROUP	CORRESPONDING NOSS/ LEVEL
C271 Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	1) MT-030-3:2012 Electroplating Manufacturing
M711 Architectural and engineering activities and related technical consultancy	1) M711-004-4:2019 Integrated Robotic System Design Operation 2) M711-004-5:2019 Integrated Robotic System Design and Management 3) M711-003-4:2019 Robotic System Programming 4) M711-003-5:2019 Robotic Integrated System Programming
C332 Installation of industrial machinery and equipment	1) MC-091-4:2016 Industrial Automation Engineering Systems Support 2) MC-091-5:2016 Industrial Automation Engineering Systems Development 3) C332-001-4:2018 Electronic Automation Technology System Development 4) C332-001-5:2018 Electronic Automation Technology System Implementation

Table 4.28: Group 281 & 282 Mapping OS vs Available NOSS (1 of 7)

SECTION	(C) MANUFACTURING		
DIVISION	(28) MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.		
GROUP	(281) MANUFACTURE OF GENERAL-PURPOSE MACHINERY (282) MANUFACTURE OF SPECIAL-PURPOSE MACHINERY		
AREA	Machinery & Equipment (M&E) Design - Electrical	Machinery & Equipment (M&E) Design - Control System	Machinery & Equipment (M&E) Design - Mechanical
LEVEL 8	Not Available	Not Available	Not Available
LEVEL 7	Not Available	Not Available	Not Available
LEVEL 6	R&D Lead Engineer	R&D Lead Engineer	R&D Lead Engineer
LEVEL 5	R&D Engineer (Electrical)	R&D Engineer (Control System)	R&D Engineer (Mechanical)
LEVEL 4	R&D Assistant Engineer (Electrical)	R&D Assistant Engineer (Control System)	R&D Assistant Engineer (Mechanical)
LEVEL 3	Electrical Supervisor	Electronic Supervisor	Mechanical Supervisor
LEVEL 2	Electrical Technician	Electronic Technician	Mechanical Technician
LEVEL 1	No Level	No Level	No Level

Table 4.29: Group 281 & 282 Mapping OS vs Available NOSS (2 of 7)

SECTION	(C) MANUFACTURING							
DIVISION	(28) MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.							
GROUP	(281) MANUFACTURE OF GENERAL-PURPOSE MACHINERY (282) MANUFACTURE OF SPECIAL-PURPOSE MACHINERY							
AREA	Metal Machining – Turning, Milling & Boring	Metal Machining - Grinding	Metal Machining - Honing	Computer Numerical Control (CNC) Machine Operation - Turning	Computer Numerical Control (CNC) Machine Operation – Milling & Boring	Computer Numerical Control (CNC) Machine Operation - Grinding	Special Tooling (Mould)	Special Tooling (Die)
LEVEL 8	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 7	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 6	Metal Machining Specialist	Metal Machining Specialist	Metal Machining Specialist	Metal Machining Specialist	Metal Machining Specialist	Metal Machining Specialist	Special Tooling (Mould) Specialist	Special Tooling (Die) Specialist
LEVEL 5	Metal Machining Production Engineer	Metal Machining Production Engineer	Metal Machining Production Engineer	MC-050-5:2012	MC-050-5:2012	MC-050-5:2012	Special Tooling (Mould) Designer	MC-031-5:2013
LEVEL 4	Metal Machining Production Assistant Engineer	Metal Machining Production Assistant Engineer	Metal Machining Production Assistant Engineer	MC-050-4:2012	MC-050-4:2012	MC-050-4:2012	Special Tooling - Mould Maker	MC-031-4:2013
LEVEL 3	Metal Machining Supervisor	Metal Machining Supervisor	Metal Machining Supervisor	MC-050-3:2015	MC-050-3:2015	MC-050-3:2015	Machine Supervisor	MC-031-3:2015
LEVEL 2	MC-050-2:2012	MC-050-2:2012	MC-050-2:2012	MC-050-2:2012	MC-050-2:2012	MC-050-2:2012	MC-050-2:2012	MC-050-2:2012
LEVEL 1	Machine Operator (Turning, Milling, Boring)	Machine Operator (Grinding)	Machine Operator (Honing)	CNC Machine Operator (Turning)	CNC Machine Operator (Milling & Boring)	CNC Machine Operator (Grinding)	Machine Operator	Machine Operator

Table 4.30: Group 281 & 282 Mapping OS vs Available NOSS (3 of 7)

SECTION	(C) MANUFACTURING					
DIVISION	(28) MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.					
GROUP	(281) MANUFACTURE OF GENERAL-PURPOSE MACHINERY (282) MANUFACTURE OF SPECIAL-PURPOSE MACHINERY					
AREA	Heat Treatment	Protective Coating - Blasting	Protective Coating - Painting	Protective Coating - Thermal spray	Protective Coating - Galvanising	Protective Coating - Plating
LEVEL 8	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 7	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 6	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 5	Heat Treatment Metallurgist	Blasting & Painting Engineer	Blasting & Painting Engineer	Not Available	Not Available	Plating Engineer
LEVEL 4	Heat Treatment Assistant Metallurgist	Blasting & Painting Assistant Engineer	Blasting & Painting Assistant Engineer	Not Available	Not Available	Plating Assistant Engineer
LEVEL 3	MC-071-3:2014	F433-004-3:2018	F433-004-3:2018	Thermal Spray Supervisor	Galvanising Supervisor	MT-030-3:2012
LEVEL 2	Heat Treatment Operator	F433-004-2:2018	F433-004-2:2018	Thermal Spray Painter	Galvanising Technician	Plating Technician
LEVEL 1	No Level	Blaster	Painter	Painter	Galviniser	Plating Operator

Table 4.31: Group 281 & 282 Mapping OS vs Available NOSS (4 of 7)

SECTION	(C) MANUFACTURING				
DIVISION	(28) MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.				
GROUP	(281) MANUFACTURE OF GENERAL-PURPOSE MACHINERY (282) MANUFACTURE OF SPECIAL-PURPOSE MACHINERY				
AREA	M&E Fabrication, Assembly and Repair - Process Engineering	M&E Fabrication, Assembly and Repair - Industrial Engineering	M&E Fabrication, Assembly and Repair - Hydraulic	M&E Fabrication, Assembly and Repair - Pneumatic	M&E Fabrication, Assembly and Repair - Electrical
LEVEL 8	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 7	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 6	Not Available	Not Available	Hydraulic Specialist	Pneumatic Specialist	Electrical Specialist
LEVEL 5	Process Engineer	Industrial Engineer	Hydraulic & Pneumatic Engineer	Hydraulic & Pneumatic Engineer	Electrical Engineer
LEVEL 4	Process Assistant Engineer	Industrial Assistant Engineer	Hydraulic & Pneumatic Assistant Engineer	Hydraulic & Pneumatic Assistant Engineer	Electrical Assistant Engineer
LEVEL 3	Production Supervisor	Production Supervisor	Hydraulic Supervisor	Pneumatic Supervisor	Electrical Supervisor
LEVEL 2	Production Technician	Production Technician	Hydraulic Technician	Pneumatic Technician	Electrical Technician
LEVEL 1	No Level	No Level	No Level	No Level	No Level

Table 4.32: Group 281 & 282 Mapping OS vs Available NOSS (5 of 7)

SECTION	(C) MANUFACTURING			
DIVISION	(28) MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.			
GROUP	(281) MANUFACTURE OF GENERAL-PURPOSE MACHINERY (282) MANUFACTURE OF SPECIAL-PURPOSE MACHINERY			
AREA	M&E Fabrication, Assembly and Repair - Electronic	M&E Fabrication, Assembly and Repair - Mechanical	M&E Fabrication, Assembly and Repair - Mechatronic	M&E Fabrication, Assembly and Repair - Automation
LEVEL 8	Not Available	Not Available	Not Available	Not Available
LEVEL 7	Not Available	Not Available	Not Available	Not Available
LEVEL 6	Electronic Specialist	Mechanical Specialist	Mechatronic Specialist	Automation Specialist
LEVEL 5	Electronic Engineer	Mechanical Engineer	Mechatronic Engineer	Automation Engineer
LEVEL 4	Electronic Assistant Engineer	Mechanical Assistant Engineer	Mechatronic Assistant Engineer	Automation Assistant Engineer
LEVEL 3	Electronic Supervisor	Mechanical Supervisor	Mechatronic Supervisor	Automation Supervisor
LEVEL 2	Electronic Technician	Mechanical Technician	Mechatronic Technician	Automation Technician
LEVEL 1	No Level	No Level	No Level	No Level

Table 4.33: Group 281 & 282 Mapping OS vs Available NOSS (6 of 7)

SECTION	(C) MANUFACTURING	
DIVISION	(28) MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.	
GROUP	(281) MANUFACTURE OF GENERAL-PURPOSE MACHINERY (282) MANUFACTURE OF SPECIAL-PURPOSE MACHINERY	
AREA	Manufacture of Machinery and Equipment Quality Management - Quality Control	Manufacture of Machinery and Equipment Quality Management - Quality Assurance
LEVEL 8	Not Available	Not Available
LEVEL 7	Not Available	Not Available
LEVEL 6	Not Available	Not Available
LEVEL 5	Quality Control Engineer	Quality Assurance Engineer
LEVEL 4	Quality Control Assistant Engineer	Quality Assurance Assistant Engineer
LEVEL 3	Quality Control Supervisor	Quality Control Supervisor
LEVEL 2	Quality Control Technician	Quality Control Technician
LEVEL 1	No Level	No Level

Table 4.34: Group 281 & 282 Mapping OS vs Available NOSS (7 of 7)

SECTION	(C) MANUFACTURING							
DIVISION	(28) MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.							
GROUP	(281) MANUFACTURE OF GENERAL-PURPOSE MACHINERY (282) MANUFACTURE OF SPECIAL-PURPOSE MACHINERY							
AREA	Robotic Engineering - Robot Design	Robotic Engineering - Integrated Robotic System Design	Robotic Engineering - Robotic Programming	Robotic Engineering - Robotic Operation Control & Maintenance	Automation System Engineering - Electrical	Automation System Engineering - Electronic	Automation System Engineering - Mechatronic	Automation System Engineering - Mechanical
LEVEL 8	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 7	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
LEVEL 6	Robotic Engineering Specialist	Robotic Engineering Specialist	Robotic Engineering Specialist	Robotic Operation Specialist	Electrical Automation System Specialist	Electronic Automation System Specialist	Mechatronic Automation System Specialist	Mechanical Automation System Specialist
LEVEL 5	Robot Designer	M711-004-5:2019	M711-003-5:2019	Robotic Operation Engineer	Electrical Engineer	C332-001-5:2018	MC-091-5:2016	Mechanical Engineer
LEVEL 4	Robot Assistant Designer	M711-004-4:2019	M711-003-4:2019	M711-003-5:2019	Electrical Assistant Engineer	C332-001-4:2018	MC-091-4:2016	Mechanical Assistant Engineer
LEVEL 3	Robot Making Technician	Robotic Operation Operator	Robotic Operation Operator	Robotic Operation Operator	Electrical Supervisor	Electronic Supervisor	Mechanical Supervisor	Mechatronic Supervisor
LEVEL 2	No Level	No Level	No Level	No Level	Electrical Technician	Electronic Technician	Mechanical Technician	Mechatronic Technician
LEVEL 1	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level

4.7 Occupational Descriptions

Occupational Descriptions (OD) is a broad, general, and written statement of a specific job, based on the findings of a job analysis. It generally includes duties, purpose, responsibilities, scope, and working conditions of a job along with the job's title, and the name or designation of the person to whom the employee reports. The OD provided in Annex 6 are the job titles that have been identified as critical or hard-to-fill job as suggested by Critical Skills Monitoring Committee (CSC) and industry representatives from focus group. There are 175 job titles identified related to this industry and 48 job titles out of total are listed as a critical job title.

The Government of Malaysia established the Critical Skills Monitoring Committee (CSC) as part of the Eleventh Malaysian Plan with the mandate to monitor skills imbalances. One of the CSC's primary objectives is to develop a Critical Occupations List (COL) to serve as a platform for the coordination of human capital development policies. The CSC is jointly chaired by Talent Corporation (TalentCorp) and the Institute for Labour Market Information and Analysis (ILMIA), which is an agency in the Ministry of Human Resources (MOHR).

4.8 Conclusion

Based on the discussions with panel members during the development workshops and survey findings, the OS of the industry is produced in this chapter. The OS would provide information of 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.

The jobs and skills in demand, and the specific steps proposed to be taken by various parties to bridge the skills gaps are elaborated so that the parties concerned could take the necessary steps to overcome such challenges.

CHAPTER 5:

DISCUSSION, RECOMMENDATION AND CONCLUSION

5.1 Discussion

Based on the findings obtained throughout the Occupational Analysis on the industry, 36 job areas have been identified and confirmed to be in tandem with MSIC with 175 job titles which 70 of them are defined as a critical job title and 48 job titles are identified as a job relevant to IR4.0. From the 175 job titles, 94 jobs as categorised as skilled workers, 68 jobs as semi-skilled workers and 13 jobs as low-skilled worker.

The job titles identified require a holistic view in development of standard, skills training and also certification for recognition. If the competency requirements documented in NOSS format, the personnel in these areas will obtain a more structured skills training and will also enable personnel who are experienced and skilled to be certified. The list of NOSS developed under the Division 28 is presented in Table 2.8. This study provides a more comprehensive view of the industry needs in terms of skill development and thus is able to determined and planned for NOSS development activities.

In collecting the primary data, the sampling method applied on this study is convenient sampling. Therefore, the overall result of this study is inconclusive and unable to represent the actual establishment of M&E industry in Malaysia. The time constraint has limited the researcher to use random sampling method and assessment instruments. There are various instruments to measure jobs in demand, competency in demand, emerging skills and related issues in M&E industry. However, the researcher only able to use the most convenient instruments.

5.2 Recommendation

Occupational framework is a document developed with a purpose to provide to industry on the overall human capital development requirement for the particular industry. It is hoped that the result of this Occupational Framework will be used as reference to fulfil the future plans of developing skilled personnel and certifying Malaysians in this sector towards improving the quality of the local sector and thus spurring Malaysia's global competitiveness.

Based on FGD and survey input the Occupational Structure was developed which outline the job area, career path, and job title based on competency level. In the process of developing the OS, there are few challenges identified for M&E industry in Malaysia. Based on the findings throughout the analysis, the recommendation for M&E industry are based on the areas, which stated as below:

Table 5.1: Areas of Improvement

AREAS OF IMPROVEMENT	PROPOSED ACTION PLAN
1. Occupational standard and curriculum development.	<ul style="list-style-type: none">a) To continue and streamline efforts in NOSS Development for areas under the M&E Sector in line with the findings of the analysis. This includes the development of the NOSS for the areas that are in demand and have not yet developed.b) Developing standard curriculum document for critical NOSS to ensure the training conducted in line with the current technology and meet industry requirement.
2. Human capital development.	<ul style="list-style-type: none">a) Continuously upgrading current manpower either through reskilling or upskilling program based on current industry trend such as IR4.0 relevant program.b) Providing input on industry requirement on workers competency requirement to DSD or any related agency such HRDF, MIDA and etc. The requirement then can

AREAS OF IMPROVEMENT	PROPOSED ACTION PLAN
	<p>be translated into structured training programs such as modular, SLDN or SKM program.</p> <p>c) Promoting workers for certification or recognition based on their specialisation through <i>Pentauliahan Pencapaian Terdahulu – PPT</i> program or even attaining professional recognition through Malaysian Board of Technologies (MBOT).</p>
3. Strengthening M&E's ILB as industry representative.	<p>a) Participate in programs organise by Industry Lead Body (ILB) to promote M&E industry to the public.</p> <p>b) Participate in occupational standard and curriculum development for any related M&E NOSS lead by ILB.</p> <p>c) Provide input and suggestion on how the ILB can help the industry to move forward.</p>
4. Take part in TVET initiative.	<p>a) Participate in government initiative to produce more skills workers through TVET as industry partner or subject matter expert.</p> <p>b) Register as SLDN centre to provide technical skills to student and workers trough apprenticeship training methodology.</p>
5. Reduce labour on foreign labour by moving up the value chain.	<p>a) Industry player form collaboration as consortiums.</p> <p>b) Setup technology knowledge and best practice sharing platforms.</p> <p>c) Induction courses and industry advisory / consultancy.</p> <p>d) Tightening the rules on hiring foreign talents.</p>
6. Increase the attractiveness of jobs in M&E industry.	<p>a) Reposition the salary structure.</p> <p>b) Market the M&E industry as a professional career choice.</p>

AREAS OF IMPROVEMENT	PROPOSED ACTION PLAN
	c) Government to sponsorships and co-subsidies with bonds upskilling course.
7. Recommended work program for the industry association.	a) Conduct an annual survey of the industry workforce. b) Mandatory association membership requirements. c) Identify industry resource persons to address skills gap.
8. Increase number of companies specialise in M&E	a) Government to promote R&D among industry players for M&E by giving incentive or tax reduction. b) Government need to help promote Malaysian M&E product and companies at global market.

By providing the industry with a structured human capital development blueprint which is the OS, it is hoped that it will be used as reference to fulfil the future plans of developing this industry as a whole.

5.3 Conclusion

The conclusion is based on the specified objectives of the Occupational Framework as elaborated below:

Objective 1: To Establish OS for Manufacture of M&E industry based on MSIC 2008

As a result of the OF conducted together with expert panel members from various organizations, a total of 36 sub-sectors and 175 job titles have been identified. In summary there total of 13 job title identified for low skilled worker, 68 job title for semi-skilled worker and 94 job title for skilled worker identified for M&E industry.

By planning and conducting the training and certification of this sector personnel in the near future, it is hoped that there will be a steady flow of local skilled and certified workers.

Objective 2: To establish job description for each job title based on latest industry OS

Based on the survey findings, the survey respondents highlighted the competency in demand shows that very importance for employee to have the required competency by the industry. The competency includes the teamwork, problem solving, self-learning, self-management/independent, planning and organising, communication skills and negotiation skills shows that the all competencies are highly importance for the industry.

Objective 3: To examine the skills in demand in the Manufacture of Machinery and Equipment Industry

The Government of Malaysia established the Critical Skills Monitoring Committee (CSC) as part of the Eleventh Malaysian Plan with the mandate to monitor skills imbalances. One of the CSC's primary objectives is to develop a Critical Occupations List (COL) to serve as a platform for the coordination of human capital development policies. The CSC is jointly chaired by Talent Corporation (TalentCorp) and the Institute for Labour Market Information and Analysis (ILMIA), which is an agency in the Ministry of Human Resources (MOHR).

This institutional structure allows the CSC to draw on ILMIA's labour market information sources, including its Labour Market Information Data Warehouse, and on TalentCorp's ties with stakeholders in the private sector. The Critical Skills Monitoring Committee (CSC) publishes an annual Critical Occupations List (COL).

The COL is a list of occupations for which there is strong evidence that there is significant labour market shortage that may be alleviated through government action. Occupations on the COL meet the criteria of being skilled, sought-after, and strategic. The COL seeks to identify and draw stakeholder attention to this set of occupations that are critical to the continued growth and development of the Malaysian economy but that are currently difficult to fill⁵⁴.

⁵⁴ Critical Skills Monitoring Committee (CSC). 2018. Critical Occupations List 2017/2018 Technical Report. CSC.

The Focus Group Discussion members have reviewed 7 critical job titles listed from COL 2018/2019 and an **Industry4WRD** comprehensively concluded with additional 70 critical job titles in Machinery and Equipment industry as listed below in Annex 4.

Objective 4: To identify jobs title related to IR4.0 in Manufacture of Machinery and Equipment industry

The advent of IR4.0 will bring with it an increase in dominance and reliance on technology to produce far-reaching efficiencies across the manufacturing sectors. The revolution of Industry 4.0 is giving manufacturers faster, more flexible, and more efficient processes to produce higher-quality goods and at lower costs. In summary there are no job title identified for low skilled worker, 20 job title for semi-skilled worker and 50 job title for skilled worker identified for M&E industry which is related to IR4.0 as determined by the industry. List of the job titles that are related to IR4.0 are listed in Annex 5.

Objective 5: To identify critical jobs in for Manufacture of Machinery and Equipment industry

The OD for all the different job titles were obtained from FGD and related reports. These OD will also serve as reference of job scope and the required competencies for NOSS development.

Several essential steps need to be undertaken jointly by stakeholders from industry, training/academic institutions and the relevant accreditations authorities to ensure that the critical occupation needs of industry are addressed.

The broad direction for achieving this:

- a) Identify and assess the qualifications, National Occupational Skills Standard (NOSS), and competencies associated with the identified critical job titles.
- b) Align and evaluate the existing training curriculum and packages.
- c) Coordination among stakeholder to;

- i) Revise and enhance the required training curriculum and packages
- ii) Expand or create new apprenticeships/ internships / attachments schemes
- iii) Joint technology and knowledge transfer between instructor / training entities with industry experts

The result of this Occupational Framework research and development work will be able to be used as key reference as how to fulfil the future plans of developing skilled personnel and certifying Malaysians in the M&E industry towards enhancing services provided by the sector players.

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ANNEX 1: MOSQF LEVEL DESCRIPTORS

MALAYSIAN OCCUPATIONAL SKILLS QUALIFICATION FRAMEWORK (MOSQF) LEVEL DESCRIPTOR

(Sources: Department of Skills Standard)

LEVEL	LEVEL DESCRIPTORS
8	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 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.
7	Achievement at this level reflects the ability to reformulate and use relevant understanding, methodologies and approaches to address problematic situations that involve many 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.
6	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 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.
5	Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to address broadly-defined, complex problems. It includes taking responsibility for planning and developing courses of action as well as exercising autonomy and judgment within broad parameters.

LEVEL	LEVEL DESCRIPTION
	It also reflects understanding of different perspectives, approaches or schools of thought and the reasoning behind them.
4	Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to address problems that are well defined but complex and non-routine. It includes taking responsibility for overall courses of action as well as exercising autonomy and judgment within fairly broad parameters. It also reflects understanding of different perspective or approaches within a sub-area of study or work.
3	Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to complete task and address problems that are well defined with a measure of complexity. It includes taking responsibility for initiating and completing tasks and procedures as well as exercising autonomy and judgments within limited parameter. It also reflects awareness of different perspectives or approaches within a sub-area of study or work.
2	Achievement at this level reflects the ability to select and use relevant knowledge, ideas, skills and procedures to complete well-defined tasks and address straightforward problem. It includes taking responsibility for completing tasks and procedures, and exercising autonomy and judgment subject to overall direction or guidance.
1	Achievement at this level reflects the ability to use relevant knowledge, skills and procedures to complete routine and predictable tasks that include responsibility for completing tasks and procedures subject to direction or guidance.

**ANNEX 2:
LIST OF CONTRIBUTORS**

**LIST OF PANEL MEMBERS FOR MANUFACTURE OF MACHINERY AND
EQUIPMENT N.E.C FRAMEWORK DEVELOPMENT**

NO	NAME	ORGANISATION
1	Christopher Raja Selvan	Puncak Enviro Sdn Bhd
2	Chan Chee Tatt	Favelle Favco Cranes (Malaysia) Sdn Bhd
3	Mohd Rozi Bin Noor	SCOMI Rail Bhd
4	Mohd Syarafi Bin Rohseli	HPR Constructor Malaysia Sdn Bhd
5	Muhammad Fauzan Bin Mat Yusoff	Destini Shipbuilding & Engineering Sdn Bhd Destini Group
6	Mohamad Noor Bin Ab Rahim	Tanjung Plus Engineering Sdn Bhd
7	Gangga Sinaran Maqnikham	Muhibbah Engineering Sdn Bhd
8	Michael Maniyarasu Sanjeevi	Gumi Asli Elektrikal Sdn Bhd
9	Osman Bin Hj Isa	Department of Safety and Health
10	Nur Hurriyatul Huda Binti Abdullah Sani	Department of Statistics Malaysia
11	YM Tengku Noradilah Binti Tengku Jalal	Department of Statistics Malaysia
12	Akmalia Binti Hanifah	Department of Statistics Malaysia

**LIST OF OCCUPATIONAL FRAMEWORK TECHNICAL EVALUATION
COMMITTEE**

NO	NAME	POSITION	ORGANISATION
1	Nur Amalina Husna Binti Mansor	Associate Executive	Department of Statistic Malaysia (DOSM)
2	Jaafar Bin Baidi	Industry Representative	Machinery and Equipment Manufacturers Association of Malaysia (MEMA)
3	Cheah Kuen Liang	Robotic Specialist	RSI Automation (M) Sdn Bhd
4	Zuriani Binti Usop	Head of Department	Machine Design Section, SIRIM Berhad
5	Mohd Izhar Bin Shaari	Senior Engineer	Senior Engineer SIRIM Berhad

LIST OF OCCUPATIONAL FRAMEWORK TECHNICAL EVALUATION COMMITTEE

NO	NAME	POSITION	ORGANISATION
1	Siti Fauziah Binti Jumadi	Principal Assistant Director	Department of Skills Development (DSD)
2	Norazura Binti Adnan	Senior Assistant Director	Department of Skills Development (DSD)
3	Syazwani Inti Azmi	Assistant Director	Department of Skills Development (DSD)
4	Nazrul Hilmi Bin Mohammad	Assistant Director	Department of Skills Development (DSD)
5	Fairuz Atida Binti Said	Assistant Director	Department of Skills Development (DSD)
6	Zainal Bin Abd Jalil	Senior Skills Development Officer	Department of Skills Development (DSD)
7	Mohd Faris Bin Jamaludin	Assistant Director	Department of Skills Development (DSD)

LIST OF WORKFORCE TEAM IN OCCUPATIONAL FRAMEWORK DEVELOPMENT

NO	NAME	ORGANISATION	RESPONSIBLE
1	Fahiszam Bin Saad	Edusure Sdn Bhd	Facilitator
2	Khairul Alia Binti Mohd Kharudin	Edusure Sdn Bhd	Proofreader Team
3	Prof. Dr. Raemah Binti Abdullah Hashim	Edusure Sdn Bhd	Researcher Team
4	Norfadilah Binti Ithnin	Edusure Sdn Bhd	Researcher Team

ANNEX 3: QUESTIONNAIRE

Machinery & Equipment (M&E) Industry Occupational Framework (OF) Survey

The Department of Skills Development (DSD), Ministry of Human Resources is currently conducting an analysis on the Occupational Framework of the 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 the 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 industry's Occupational Framework. 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:

Fahiszam Bin Saad: fahiszam_pita@yahoo.com.my

Survey Respondent Details

Name :

Position :

Organisation :

Date :

Please answer the questions below in the space provided, additional pages may be added if necessary. There are 4 section in this 9-page survey.

DEMOGRAPHICS

1.1 Age

☐ 20-30

☐ 31-40

☐ 40-Upwards

1.2 Gender

☐ Male

☐ Female

1.3 Position in organisation

☐ Specialist/Managing Director/General Manager

☐ Production Engineer/Engineer

☐ Assistant Engineer/Field Engineer/Assistant Manage

☐ Supervisor

☐ Technician/Machinist

☐ Other : _____

1.4 Company Location (State)

1.5 Size of Company

☐ Small Medium Enterprise (SME)

☐ Small Medium Industry (SMI)

☐ Government Link Company (GLC)

☐ Multinational Corporation (MNC)

SECTION 1: COMPETENCY IN DEMAND

2.1 What is your area of expertise?

- ☐ Engineering Design
- ☐ M&E Fabrication, Assembly and Repair
- ☐ Machining & Special Tooling
- ☐ Quality Management
- ☐ Industrial Automation Engineering
- ☐ Other : _____

2.2 Provide demand rating for the job area under M&E industry

	High In Demand	In Demand	Low In Demand
Engineering Design	○	○	○
M&E Fabrication, Assembly and Repair	○	○	○
Machining & Special Tooling	○	○	○
Quality Management	○	○	○
Industrial Automation Engineering	○	○	○

1	2	3	4	5
Low in Insignificant	Insignificant	Moderate	Importance	Highly Importance

2.3 Employability skills required for the workers in M&E industry

i. Communication Skills							
		1	2	3	4	5	
	Low Insignificant	○	○	○	○	○	Highly Importance
ii. Teamwork							
		1	2	3	4	5	
	Low Insignificant	○	○	○	○	○	Highly Importance

iii. Problem Solving							
		1	2	3	4	5	
	Low Insignificant	○	○	○	○	○	Highly Importance
iv. Negotiation Skills							
		1	2	3	4	5	
	Low Insignificant	○	○	○	○	○	Highly Importance
v. Planning and Organising							
		1	2	3	4	5	
	Low Insignificant	○	○	○	○	○	Highly Importance
vi. Self-Management/Independent							
		1	2	3	4	5	
	Low Insignificant	○	○	○	○	○	Highly Importance
vii. Self-Learning							
		1	2	3	4	5	
	Low Insignificant	○	○	○	○	○	Highly Importance

2.4 Do you think the graduates / trainee / apprentice / current workers possess the skills required by the industry??

☐ Yes

☐ No

2.5 What are the reasons for the skills gap? Tick (✓) where applicable, you may tick more than once.

☐ Education / training mismatch

☐ Major changes in traditional training and new skill requirements

☐ Attitude (e.g. lack of desire to work)

☐ Other : _____

SECTION 2: JOBS IN DEMAND

1	2	3
High Shortage	Mid Shortage	Low Shortage

- 3.1 Based on your observation, which occupation is experiencing shortage of manpower in M&E Industry?

Tick where applicable.

Category of Skills Description

Skilled Worker: Specialist, Engineer, Assistant Engineer, Draughtman and Technicians

Semi-Skilled Workers: Machine Operators, Painter, Blaster, Galvaniser and Plating Operator

Low Skilled Workers: General Workers

i. Engineering Design

	High Shortage	Moderate Shortage	Low Shortage
Skilled Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Semi-Skilled Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Low-Skilled Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

ii. M&E Fabrication, Assembly and Repair

	High Shortage	Moderate Shortage	Low Shortage
Skilled Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Semi-Skilled Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Low-Skilled Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

iii. Machining and Special Tooling

	High Shortage	Moderate Shortage	Low Shortage
Skilled Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Semi-Skilled Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Low-Skilled Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

iv. Quality Management

	High Shortage	Moderate Shortage	Low Shortage
Skilled Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Semi-Skilled Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Low-Skilled Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

v. Industrial Automation Engineering

	High Shortage	Moderate Shortage	Low Shortage
Skilled Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Semi-Skilled Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Low-Skilled Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SECTION 3: EMERGING SKILLS

1	2	3
High in Demand	In Demand	Low in Demand

4.1 Do you think Industry Revolution 4.0 (IR4.0) would give an impact to M&E Industry?

Yes ☐

No ☐

Not Sure ☐

4.2 Listed below are the nine (9) technology drives/pillars of IR4.0. Which job area is likely to be affected by these 9 technology drives/pillars of IR4.0? Tick (✓) where applicable, you may tick more than once. Both presented and pre-read material

	Engineering Design	M&E Fabrication, Assembly and Repair	Machining and Special Tooling	Quality Management	Industrial Automation Engineering
Autonomous Robots	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Big Data Analytics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cloud Computing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Internet of Things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Additive Manufacturing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
System Integration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cybersecurity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Augmented Reality	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Simulation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SECTION 4: RELATED ISSUES

5.1 What is/are the key issue/s related to Manufacture of Machinery and Equipment (M&E) industry?

Please rate **ALL** the key issues by using the scale below.

1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree

NO.	KEY ISSUES	JOB AREAS				
		Engineering Design	&E Fabrication, Assembly and Repair	Machining and Special Tooling	Quality Management	Industrial Automation Engineering
1	Insufficient manpower					
2	Low skilled and low performance workforce					
3	High dependency on foreign labour					
4	Underpayment of wages lead to high turn over					
5	Economic conditions					
6	Technological change					
7	Resistance to change among industry player					
8	Youth Involvement					
9	Poor facilities and amenities for workers					
10	Insufficient of extension officer services					

ANNEX 4:
LIST OF CRITICAL JOB TITLES

List of Critical Job Titles

NO	CRITICAL JOB TITLE	AREA	LEVEL	LS	SS	S
1	R&D Engineer (Electrical)*	Machinery & Equipment (M&E) Design - Electrical	5			✓
2	R&D Assistant Engineer (Electrical)	Machinery & Equipment (M&E) Design - Electrical	4			✓
3	Electrical Supervisor*	Machinery & Equipment (M&E) Design - Electrical	3		✓	
4	Electrical Technician*	Machinery & Equipment (M&E) Design - Electrical	2		✓	
5	R&D Engineer (Control System)	Machinery & Equipment (M&E) Design - Control System	5			✓
6	R&D Assistant Engineer (Control System)	Machinery & Equipment (M&E) Design - Control System	4			✓
7	R&D Engineer (Mechanical)*	Machinery & Equipment (M&E) Design - Mechanical	5			✓
8	R&D Assistant Engineer (Mechanical)	Machinery & Equipment (M&E) Design - Mechanical	4			✓
9	Mechanical Supervisor*	Machinery & Equipment (M&E) Design - Mechanical	3		✓	
10	Mechanical Technician*	Machinery & Equipment (M&E) Design - Mechanical	2		✓	
11	Metal Machining Production Engineer	Metal Machining – Turning, Milling & Boring	5			✓
12	Metal Machining Production Assistant Engineer	Metal Machining – Turning, Milling & Boring	4			✓
13	Metal Machining Production Engineer	Metal Machining - Grinding	5			✓
14	Metal Machining Production Assistant Engineer	Metal Machining - Grinding	4			✓
15	Metal Machining Production Engineer	Metal Machining - Honing	5			✓

NO	CRITICAL JOB TITLE	AREA	LEVEL	LS	SS	S
16	Metal Machining Production Assistant Engineer	Metal Machining - Honing	4			✓
17	Metal Machining Production Engineer	Computer Numerical Control (CNC) Machine Operation - Turning	5			✓
18	Metal Machining Production Assistant Engineer	Computer Numerical Control (CNC) Machine Operation - Turning	4			✓
19	Metal Machining Production Engineer	Computer Numerical Control (CNC) Machine Operation – Milling & Boring	5			✓
20	Metal Machining Production Assistant Engineer	Computer Numerical Control (CNC) Machine Operation – Milling & Boring	4			✓
21	Metal Machining Production Engineer	Computer Numerical Control (CNC) Machine Operation - Grinding	5			✓
22	Metal Machining Production Assistant Engineer	Computer Numerical Control (CNC) Machine Operation - Grinding	4			✓
23	Heat Treatment Metallurgist*	Heat Treatment	5			✓
24	Heat Treatment Assistant Metallurgist	Heat Treatment	4			✓
25	Plating Engineer	Protective Coating - Plating	5			✓
26	Plating Assistant Engineer	Protective Coating - Plating	4			✓
27	Industrial Engineer*	M&E Fabrication, Assembly and Repair - Industrial Engineering	5			✓
28	Industrial Assistant Engineer	M&E Fabrication, Assembly and Repair - Industrial Engineering	4			✓
29	Electrical Engineer*	M&E Fabrication, Assembly and Repair - Electrical	5			✓
30	Electrical Assistant Engineer	M&E Fabrication, Assembly and Repair - Electrical	4			✓
31	Electrical Supervisor*	M&E Fabrication, Assembly and Repair - Electrical	3		✓	

NO	CRITICAL JOB TITLE	AREA	LEVEL	LS	SS	S
32	Electrical Technician*	M&E Fabrication, Assembly and Repair - Electrical	2		✓	
33	Electronic Engineer*	M&E Fabrication, Assembly and Repair - Electronic	5			✓
34	Electronic Assistant Engineer	M&E Fabrication, Assembly and Repair - Electronic	4			✓
35	Mechanical Engineer*	M&E Fabrication, Assembly and Repair - Mechanical	5			✓
36	Mechanical Assistant Engineer	M&E Fabrication, Assembly and Repair - Mechanical	4			✓
37	Mechanical Supervisor*	M&E Fabrication, Assembly and Repair - Mechanical	3		✓	
38	Mechanical Technician*	M&E Fabrication, Assembly and Repair - Mechanical	2		✓	
39	Quality Control Engineer*	Manufacture of Machinery and Equipment Quality Management - Quality Control	5			✓
40	Quality Control Assistant Engineer	Manufacture of Machinery and Equipment Quality Management - Quality Control	4			✓
41	Quality Assurance Engineer*	Manufacture of Machinery and Equipment Quality Management - Quality Assurance	5			✓
42	Quality Assurance Assistant Engineer	Manufacture of Machinery and Equipment Quality Management - Quality Assurance	4			✓
43	Robot Designer	Robotic Engineering - Robot Design	5			✓
44	Robot Assistant Designer	Robotic Engineering - Robot Design	4			✓
45	Robot Making Technician	Robotic Engineering - Robot Design	3		✓	

NO	CRITICAL JOB TITLE	AREA	LEVEL	LS	SS	S
46	Robotic System Design Engineer	Robotic Engineering - Integrated Robotic System Design	5			✓
47	Robotic System Design Assistant Engineer	Robotic Engineering - Integrated Robotic System Design	4			✓
48	Robotic Operation Operator	Robotic Engineering - Integrated Robotic System Design	3		✓	
49	Robotic System Design Engineer	Robotic Engineering - Robotic Programming	5			✓
50	Robotic System Design Assistant Engineer	Robotic Engineering - Robotic Programming	4			✓
51	*Robotic Operation Operator	Robotic Engineering - Robotic Programming	3		✓	
52	Robotic System Design Engineer	Robotic Engineering - Robotic Operation Control & Maintenance	5			✓
53	Robotic System Design Assistant Engineer	Robotic Engineering - Robotic Operation Control & Maintenance	4			✓
54	Robotic Operation Operator	Robotic Engineering - Robotic Operation Control & Maintenance	3		✓	
55	Electrical Engineer*	Automation System Engineering - Electrical	5			✓
56	Electrical Assistant Engineer	Automation System Engineering - Electrical	4			✓
57	Electrical Supervisor*	Automation System Engineering - Electrical	3		✓	
58	Electrical Technician*	Automation System Engineering - Electrical	2		✓	
59	Electronic Engineer*	Automation System Engineering - Electronic	5			✓
60	Electronic Asst. Engineer	Automation System Engineering - Electronic	4			✓
61	Electronic Supervisor*	Automation System Engineering - Electronic	3		✓	
62	Electronic Technician*	Automation System Engineering - Electronic	2		✓	
63	Mechatronic Engineer*	Automation System Engineering - Mechatronic	5			✓
64	Mechatronic Asst. Engineer	Automation System Engineering - Mechatronic	4			✓

NO	CRITICAL JOB TITLE	AREA	LEVEL	LS	SS	S
65	Mechatronic Supervisor*	Automation System Engineering - Mechatronic	3		✓	
66	Mechatronic Technician*	Automation System Engineering - Mechatronic	2		✓	
67	Mechanical Engineer*	Automation System Engineering - Mechanical	5			✓
68	Mechanical Assistant Engineer	Automation System Engineering - Mechanical	4			✓
69	Mechanical Supervisor*	Automation System Engineering - Mechanical	3		✓	
70	Mechanical Technician*	Automation System Engineering - Mechanical	2		✓	
Total				0	20	50

Note: LS - Low-Skilled Workers

SS - Semi-Skilled Workers

S - Skilled Workers

* Job Title listed from COL 2018/2019

ANNEX 5:
JOB TITLE RELEVANT TO IR4.0

Job Relevant to IR4.0

No.	Critical Job Title	Area	Level
1	R&D Engineer (Electrical)	Machinery & Equipment (M&E) Design - Electrical	5
2	R&D Assistant Engineer (Electrical)	Machinery & Equipment (M&E) Design - Electrical	4
3	Electrical Supervisor	Machinery & Equipment (M&E) Design - Electrical	3
4	Electrical Technician	Machinery & Equipment (M&E) Design - Electrical	2
5	R&D Engineer (Control System)	Machinery & Equipment (M&E) Design - Control System	5
6	R&D Assistant Engineer (Control System)	Machinery & Equipment (M&E) Design - Control System	4
7	Electronic Supervisor	Machinery & Equipment (M&E) Design - Control System	3
8	Electronic Technician	Machinery & Equipment (M&E) Design - Control System	2
9	R&D Engineer (Mechanical)	Machinery & Equipment (M&E) Design - Mechanical	5
10	R&D Assistant Engineer (Mechanical)	Machinery & Equipment (M&E) Design - Mechanical	4
11	Mechanical Supervisor	Machinery & Equipment (M&E) Design - Mechanical	3
12	Mechanical Technician	Machinery & Equipment (M&E) Design - Mechanical	2
13	Robotic Engineering Specialist	Robotic Engineering - Robot Design	6
14	Robot Designer	Robotic Engineering - Robot Design	5
15	Robot Assistant Designer	Robotic Engineering - Robot Design	4
16	Robot Making Technician	Robotic Engineering - Robot Design	3
17	Robotic Engineering Specialist	Robotic Engineering - Integrated Robotic System Design	6
18	Robotic System Design Engineer	Robotic Engineering - Integrated Robotic System Design	5
19	Robotic System Design Assistant Engineer	Robotic Engineering - Integrated Robotic System Design	4
20	Robotic Operation Operator	Robotic Engineering - Integrated Robotic System Design	3
21	Robotic Engineering Specialist	Robotic Engineering - Robotic Programming	6
22	Robotic System Design Engineer	Robotic Engineering - Robotic Programming	5

No.	Critical Job Title	Area	Level
23	Robotic System Design Assistant Engineer	Robotic Engineering - Robotic Programming	4
24	Robotic Operation Operator	Robotic Engineering - Robotic Programming	3
25	Robotic Operation Specialist	Robotic Engineering - Robotic Operation Control & Maintenance	6
26	Robotic System Design Engineer	Robotic Engineering - Robotic Operation Control & Maintenance	5
27	Robotic System Design Assistant Engineer	Robotic Engineering - Robotic Operation Control & Maintenance	4
28	Robotic Operation Operator	Robotic Engineering - Robotic Operation Control & Maintenance	3
29	Electrical Automation System Specialist	Automation System Engineering - Electrical	6
30	Electrical Engineer	Automation System Engineering - Electrical	5
31	Electrical Assistant Engineer	Automation System Engineering - Electrical	4
32	Electrical Supervisor	Automation System Engineering - Electrical	3
33	Electrical Technician	Automation System Engineering - Electrical	2
34	Electronic Automation System Specialist	Automation System Engineering - Electronic	6
35	Electronic Engineer	Automation System Engineering - Electronic	5
36	Electronic Asst. Engineer	Automation System Engineering - Electronic	4
37	Electronic Supervisor	Automation System Engineering - Electronic	3
38	Electronic Technician	Automation System Engineering - Electronic	2
39	Mechatronic Automation System Specialist	Automation System Engineering - Mechatronic	6
40	Mechatronic Engineer	Automation System Engineering - Mechatronic	5
41	Mechatronic Asst. Engineer	Automation System Engineering - Mechatronic	4
42	Mechatronic Supervisor	Automation System Engineering - Mechatronic	3
43	Mechatronic Technician	Automation System Engineering - Mechatronic	2
44	Mechanical Automation System Specialist	Automation System Engineering - Mechanical	6
45	Mechanical Engineer	Automation System Engineering - Mechanical	5

No.	Critical Job Title	Area	Level
46	Mechanical Assistant Engineer	Automation System Engineering - Mechanical	4
47	Mechanical Supervisor	Automation System Engineering - Mechanical	3
48	Mechanical Technician	Automation System Engineering - Mechanical	2

ANNEX 6:
OCCUPATIONAL DESCRIPTION (OD)

SECTION: (C) MANUFACTURING

DIVISION: (28) MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C

GROUP: (281) MANUFACTURE OF GENERAL-PURPOSE MACHINERY
(282) MANUFACTURE OF SPECIAL-PURPOSE MACHINERY

MSIC GROUP : 281 & 282
AREA : Machinery & Equipment (M&E) Design (Electrical)
JOB TITLE : Electrical Technician
LEVEL : 2

RESPONSIBILITIES

Electrical Technician is responsible to install, maintain, and repair electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service street lights, intercom systems, or electrical control systems.

Knowledge:

- Interpretation of Wiring Circuit Diagram
- Electrical Measuring instrument
- Machining Process
- Electrical Power
- Electrical Wiring

Skills:

- Interpret design drawing.
- Prepare installation, maintenance and inspection tools and equipment.
- Identify electrical component specification.
- Carry out assembly of electrical component.
- Carry out cable laying as per diagram.
- Assist in testing activities for electrical system.
- Conduct functionality test for electrical system.
- Carry out preventive and corrective for machine and equipment maintenance.
- Carry out machine parameter setting.
- Record machine operation checklist.
- Prepare machine operation report.

Attributes (Attitude/Safety/Environmental):

- Responsible in carrying out electrical wiring.
- Cooperate with another team in carrying out.
- Liaise with another department.
- Proactive in updating report.
- Actively in communicating with teams.
- Adhere to Occupational Safety and Health Compliance Requirement.

MSIC GROUP : 281 & 282
AREA : Machinery & Equipment (M&E) Design (Electrical)
JOB TITLE : Electrical Supervisor
LEVEL : 3

RESPONSIBILITIES

Electrical Supervisor is responsible to supervise installation, maintaining, and repairing electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service street lights, intercom systems, or electrical control systems.

Knowledge:

- Interpretation of Wiring Circuit Diagram
- Electrical Measuring instrument
- Machining Process
- Electrical Power
- Electrical Wiring

Skills:

- Produce electrical design drawing.
- Manages the electrical maintenance work force.
- Prepare maintenance operation scheduling.
- Ensures that all data collected regarding work process is accurate and complete when being entered into data bank.
- Coordinate installation, maintenance and inspection tools and equipment preparation.
- Confirm electrical component assembly.
- Confirm functionality test result for electrical system.
- Prepare and coordinate preventive and corrective for machine and equipment maintenance activities.
- Confirm machine parameter setting.

Attributes (Attitude/Safety/Environmental):

- Responsible in carrying out tasking.
- Liaise with another department.
- Proactive in updating report.
- Actively in communicating with teams.
- Adhere to Occupational Safety and Health Compliance Requirement.

MSIC GROUP : 281 & 282
AREA : Machinery & Equipment (M&E) Design (Electrical)
JOB TITLE : R&D Assistant Engineer (Electrical)
LEVEL : 4

RESPONSIBILITIES

R&D Assistant Engineer (Electrical) is responsible to assist in designing electrical systems by developing and testing component. They also responsible to planning and managing electrical operation activities

Knowledge:

- Lean Manufacturing
- Power Management
- Ingress Protection (IP) Rating
- Electrical Load Calculation and Component Selection
- Compliance Standard and Power Consumption for Electrical Component
- Power Protection System and Grounding

Skills:

- Carry out electrical system design.
- Carry out electrical system testing and commissioning.
- Carry out electrical documentation management.
- Provides relevant information and documentation to other parties on electrical system.
- Carry out resources planning for electrical system team.
- Assist in project management.

Attributes (Attitude/Safety/Environmental):

- Analytical skills in designing electrical systems.
- Leadership and People Management.
- Actively in communicate with another department.
- Creative and Innovative Responsibility.
- Work closely in creating a good team work.
- Adhere to Occupational Safety and Health Compliance Requirement.

MSIC GROUP : 281 & 282
AREA : Machinery & Equipment (M&E) Design (Electrical)
JOB TITLE : R&D Engineer (Electrical)
LEVEL : 5

RESPONSIBILITIES

R&D Engineer (Electrical) is responsible to design electrical systems by developing and testing component. They also responsible to planning and managing electrical operation activities.

Knowledge:

- Lean Manufacturing
- Power Management
- Ingress Protection (IP) Rating
- Electrical Load Calculation and Component Selection
- Compliance Standard and Power Consumption for Electrical Component
- Power Protection System and Grounding

Skills:

- Verify electrical system design.
- Verify electrical system testing and commissioning.
- Verify electrical documentation management.
- Provides relevant information and documentation to other parties on electrical system.
- Manage resources planning for electrical system team.
- Monitor in project management.

Attributes (Attitude/Safety/Environmental):

- Detailed understanding of how role and branch contributes to the organisation.
- Identify relationship between organisational goals and operational tasks.
- Adhere to Occupational Safety and Health Compliance Requirement.
- Ensure quality outcomes and encourage adherence to procedures.
- Manage own team, identifying and addressing performance issues as they arise.
- Prepare documents clearly and report concisely using different mediums.
- Competent with 3D CAD modelling systems with ability to draft engineering drawings.
- Demonstrate technical problem-solving abilities through experiments, analysis and systematic methods, technical documentation.

MSIC GROUP : 281 & 282
AREA : Machinery & Equipment (M&E) Design (Control System)
JOB TITLE : R&D Assistant Engineer (Control System)
LEVEL : 4

RESPONSIBILITIES

R&D Assistant Engineer (Control System) is responsible to assist in researching, designing, developing, or testing automation, intelligent systems, smart devices, or industrial systems control. They also responsible to assist in managing and planning operation works.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value
- Circuit theory
- Finite Element Analysis (FEA)
- Electronic Component Selection
- Ingress Protection rating (IP rating)
- Embedded system programming
- Networking and Communication Protocol
- Instrumentation and Control

Skills:

- Determine regulatory and authority body compliance requirement
- Prepare and validate quality management requirement.
- Prepare and evaluate product conceptual design modelling.
- Carry out design engineering analysis.
- Prepare design specification.
- Produce BOM list.

Attributes (Attitude/Safety/Environmental):

- Detailed understanding of how role and branch contributes to the organisation.
- Identify relationship between organisational goals and operational tasks.
- Recognise the link between interconnected issues.
- Share information and assist others to adapt to a changing environment.
- Document and maintain accurate records.
- Identify learning opportunities for others and delegate tasks effectively.
- Prepare documents clearly and report concisely.

MSIC GROUP : 281 & 282
AREA : Machinery & Equipment (M&E) Design (Control System)
JOB TITLE : R&D Engineer (Electrical)
LEVEL : 5

RESPONSIBILITIES

R&D Engineer (Control System) is responsible to research, design, develop, or test automation, intelligent systems, smart devices, or industrial systems control. They also responsible to managing and planning operation works.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value
- Circuit theory
- Finite Element Analysis (FEA)
- Electronic Component Selection
- Ingress Protection rating (IP rating)
- Embedded system programming
- Networking and Communication Protocol
- Instrumentation and Control

Skills:

- Determine regulatory and authority body compliance requirement.
- Prepare and validate quality management requirement.
- Prepare and evaluate product conceptual design modelling.
- Carry out design engineering analysis.
- Prepare design specification.
- Produce BOM list.
- Carry out design fabrication and assembly.
- Perform testing and commissioning on product design (NDT & DT).
- Execute fine tuning and optimisation for product design.
- Produce final product prototyping.
- Perform product prototype documentation management including user manuals, operating manual and maintenance manual.
- Provide relevant information and documentation to other parties.

Attributes (Attitude/Safety/Environmental):

- Detailed understanding of how role and branch contributes to the organisation.
- Identify relationship between organisational goals and operational tasks.

- Adhere to Occupational Safety and Health Compliance Requirement.
 - Ensure quality outcomes and encourage adherence to procedures.
 - Manage own team, identifying and addressing performance issues as they arise.
 - Prepare documents clearly and report concisely using different mediums.
 - Competent with 3D CAD modelling systems with ability to draft engineering drawings
- Demonstrate technical problem-solving abilities through experiments, analysis and systematic methods, technical documentation.

MSIC GROUP : 281 & 282
AREA : Machinery & Equipment (M&E) Design (Mechanical)
JOB TITLE : Mechanical Technician
LEVEL : 2

RESPONSIBILITIES

Mechanical Technician is responsible to assemble or fabricate mechanical parts, pieces or products using a variety of tools and equipment according to required specifications in a specific area of a production line in a manufacturing organisation.

Knowledge:

- Machining Process
- Interpretation of Wiring Circuit Diagram
- Interpretation of Circuit Diagram
- Interpretation of engineering drawing
- Quality Management System (QMS)
- Embedded System Programming
- Network and Communication Protocol
- Automation Engineering
- Sensoring and Image Processing

Skills:

- Check equipment and operating systems.
- Ensure mechanical operations, standards and controls are maintained.
- Resolve motor, pump, conveyor and hydraulic problems.
- Repair and perform preventive maintenance as per established standards.
- Handle personal tools for job including up-to-date documented personal tool lists.
- Handle time accounting and complete work order.

Attributes (Attitude/Safety/Environmental):

- Meticulous in preparing work report.
- Communicate effectively with team work and client.
- Creative in solving problems.
- Work closely with another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Machinery & Equipment (M&E) Design (Mechanical)
JOB TITLE : Mechanical Supervisor
LEVEL : 3

RESPONSIBILITIES

Mechanical Supervisor is responsible to supervise and monitor assembling or fabricating mechanical parts, pieces or products using a variety of tools and equipment according to required specifications in a specific area of a production line in a manufacturing organisation.

Knowledge:

- Machining Process
- Interpretation of Wiring Circuit Diagram
- Interpretation of Circuit Diagram
- Interpretation of engineering drawing
- Quality Management System (QMS)
- Embedded System Programming
- Network and Communication Protocol
- Automation Engineering
- Sensoring and Image Processing

Skills:

- Inspect mechanics' repairs and installations.
- Maintain parts inventory.
- Ensure compliance with safety practices.
- Evaluate mechanics work and performance.
- Prepare maintenance operation scheduling.
- Ensures that all data collected regarding work process is accurate and complete.
- Coordinate installation, maintenance and inspection tools and equipment preparation.
- Confirm mechanical component assembly.
- Prepare and coordinate preventive and corrective for machine and equipment maintenance activities.
- Confirm machine parameter setting.
- Perform supervisory function.

Attributes (Attitude/Safety/Environmental):

- Communicate effectively with team work and client.
- Creative in solving problems.
- Work closely with another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Machinery & Equipment (M&E) Design (Mechanical)
JOB TITLE : R&D Assistant Engineer (Mechanical)
LEVEL : 4

RESPONSIBILITIES

R&D Assistant Engineer (Mechanical) is responsible to assist in designing and planning mechanical and electromechanical products and systems by developing and testing specifications and methods.

Knowledge:

- Lean Manufacturing
- Power Management
- Ingress Protection (IP) Rating
- Electrical Load Calculation and Component Selection
- Compliance Standard and Power Consumption for Electrical Component
- Power Protection System and Grounding

Skills:

- Determine regulatory and authority body compliance requirement.
- Assist in preparing and evaluating product conceptual design modelling.
- Assist in carrying out design engineering analysis.
- Assist in preparing design specification.
- Assist in preparing BOM list.
- Carry out design fabrication and assembly.
- Perform testing and commissioning on product design (NDT & DT).
- Execute fine tuning and optimisation for product design.
- Assist in producing final product prototyping.
- Assist in carrying out product prototype documentation management including user manuals, operating manual and maintenance manual.
- Provide relevant information and documentation to other parties.

Attributes (Attitude/Safety/Environmental):

- Analytical skills in solving problems.
- Ensure designs meet legal guidelines and safety requirements.
- Accurate in performing equipment and system calculations.
- Creative in developing and designing products.
- Communicate effectively with teams.
- Work closely with staff and other department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Machinery & Equipment (M&E) Design (Mechanical & Mechatronic)
JOB TITLE : R&D Engineer (Mechanical)
LEVEL : 5

RESPONSIBILITIES

R&D Engineer (Mechanical) is responsible to design, manufacture and maintain everything from small parts like miniature connectors to large machine tools like drill presses. They take a product from start to finish, and design for aesthetics, functionality, and durability.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Finite Element Analysis (FEA)
- Machining Process
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value

Skills:

- Determine regulatory and authority body compliance requirement.
- Prepare and validate quality management requirement.
- Prepare and evaluate product conceptual design modelling.
- Carry out design engineering analysis.
- Prepare design specification.
- Produce BOM list.
- Carry out design fabrication and assembly.
- Perform testing and commissioning on product design (NDT & DT).
- Execute fine tuning and optimisation for product design.
- Produce final product prototyping.
- Perform product prototype documentation management including user manuals, operating manual and maintenance manual.
- Provide relevant information and documentation to other parties.

Attributes (Attitude/Safety/Environmental):

- Identify relationship between organisational goals and operational tasks.
- Adhere to Occupational Safety and Health Compliance Requirement.
- Ensure quality outcomes and encourage adherence to procedures.
- Manage own team, identifying and addressing performance issues as they arise.
- Prepare documents clearly and report concisely using different mediums.

- Competent with 3D CAD modelling systems with ability to draft engineering drawings.
- Demonstrate technical problem-solving abilities through experiments, analysis and systematic methods, technical documentation.

MSIC GROUP	: 281 & 282
AREA	: Metal Machining (Turning, Milling, Boring, Grinding, Honing, CNC machine operation)
JOB TITLE	: Metal Machining Production Assistant Engineer
LEVEL	: 4

RESPONSIBILITIES

Metal Machining Production Assistant Engineer is responsible to set up and operate a variety of machine tools to produce precision parts and instruments. Includes precision instrument makers who fabricate, modify, or repair mechanical instruments. May also fabricate and modify parts to make or repair machine tools or maintain industrial machines, applying knowledge of mechanics, shop mathematics, metal properties, layout, and machining procedures.

Knowledge:

- Interpretation of Engineering Drawing
- GD&T
- CNC Machine Operation
 - Operation manual
 - Maintenance manual
 - Safety instruction
- Measuring instrument
- CAM command
 - M code
 - G code
- Machining Process
- Jigs and Fixtures

Skills:

- Plans, designs, purchases, and implements machining processes and equipment in an industrial plant.
- Determine parts and tools needed in order to achieve manufacturing goals.
- Design, develop, implement, and analyses technical products and systems.
- Perform equipment engineering design evaluations and documents results.
- Carry out analysis to improve equipment availability and capability by utilizing continuous improvement tools and working cross functionally.
- Implement operation and maintenance SOP for machine and equipment.
- Validate equipment purchasing requirements.
- Liaise with others department.
- Setup reduction and changeovers according to product specification.

- Recommend alterations to development and design to improve quality of products and/or procedures.
- Identify problems with product and performance and recommends solutions or enhancements.
- Prepare project costing.
- Lead troubleshooting activities for machine fault.
- Prepare SOP and method of statement for machine operation.
- Liaise with outsourcing vendor and supplier for machine maintenance and parts purchase.
- Develop CNC program for machine operation.

Attributes (Attitude/Safety/Environmental):

- Responsibility.
- Team work.
- Relation with another department.
- Analytical skills.
- Problem solving skills.
- Communication skills.
- Time management skills.
- Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.
- Adhere Environmental Compliance.

MSIC GROUP : 281 & 282
AREA : Metal Machining (Turning, Milling, Boring, Grinding, Honing, CNC machine operation)
JOB TITLE : Metal Machining Production Engineer
LEVEL : 5

RESPONSIBILITIES

Metal Machining Production Engineer is responsible to design, manufacture and maintain everything from small parts like miniature connectors to large machine tools like drill presses. They take a product from start to finish, and design for aesthetics, functionality, and durability.

Knowledge:

- Overall equipment effectiveness (OEE)
- Total Quality Management (TQM)
- People management
- Resources planning
- Strategic planning
- SOP and method of statement preparation
- CNC Programing
- Risk assessment
- Office management
- Purchasing procedure
- Project costing

Skills:

- Prepare production planning for machine operation.
- Lead machining operation.
- Analyse machining operation efficiency.
- Carry out troubleshooting of machine failure.
- Prepare maintenance planning for machine.
- Evaluate new machine for machining operation.
- Perform machine capability analysis.
- Identify optimisation requirements for current machine.
- Carry out machine load balancing.
- Prepare SOP and method of statement for machine operation.
- Liaise with outsourcing vendor and supplier for machine maintenance and parts purchase.
- Develop CNC program for machine operation.

Attributes (Attitude/Safety/Environmental):

- Detailed understanding of how role and branch contributes to the organisation.
- Identify relationship between organisational goals and operational tasks.
- Adhere to Occupational Safety and Health Compliance Requirement.

- Ensure quality outcomes and encourage adherence to procedures.
- Manage own team, identifying and addressing performance issues as they arise.
- Prepare documents clearly and report concisely using different mediums.
- Competent with 3D CAD modelling systems with ability to draft engineering drawings.
- Demonstrate technical problem-solving abilities through experiments, analysis and systematic methods, technical documentation.

MSIC GROUP : 281 & 282
AREA : Heat Treatment
JOB TITLE : Heat Treatment Assistant Metallurgist
LEVEL : 4

RESPONSIBILITIES

Heat Treatment Assistant Metallurgist is responsible to assist in designing, manufacturing and maintaining small parts like miniature connectors to large machine tools like drill presses. They take a product from start to finish, and design for aesthetics, functionality, and durability.

Knowledge:

- Familiarity with statistical process control method.
- Site Acceptance Test (SAT) and Uniformity check for heat treatment.
- Basic metallurgist of alloy and gasses.
- Material selection and treatment process.
- Root cause analysis.
- Cost analysis.
- Heat treatment cycle and processes specification.
- Procedure to develop heat treatment process SOP.

Skills:

- Assist in planning, design and writing specifications for the purchase of heat treat furnaces and tooling.
- Troubleshoot and support all heat treat processing.
- Assist in planning items that need corrected on furnaces.
- Provide analysis for purchase of new furnaces and/or heat treat equipment.
- Benchmark heat treating technology throughout the world.
- Develop and/or maintain preventative maintenance program.

Attributes (Attitude/Safety/Environmental):

- Detailed understanding of how role and branch contributes to the organisation.
- Identify relationship between organisational goals and operational tasks.
- Adhere to Occupational Safety and Health Compliance Requirement.
- Ensure quality outcomes and encourage adherence to procedures.
- Manage own team, identifying and addressing performance issues as they arise.
- Prepare documents clearly and report concisely using different mediums.
- Competent with 3D CAD modelling systems with ability to draft engineering drawings.
- Demonstrate technical problem-solving abilities through experiments, analysis and systematic methods, technical documentation/

MSIC GROUP : 281 & 282
AREA : Heat Treatment
JOB TITLE : Heat Treatment Metallurgist
LEVEL : 5

RESPONSIBILITIES

Heat Treatment Metallurgist is responsible to design, manufacture and maintain everything from small parts like miniature connectors to large machine tools like drill presses. They take a product from start to finish, and design for aesthetics, functionality, and durability.

Knowledge:

- Familiarity with statistical process control method.
- Site Acceptance Test (SAT) and Uniformity check for heat treatment.
- Basic metallurgist of alloy and gasses.
- Material selection and treatment process.
- Root cause analysis.
- Cost analysis.
- Heat treatment cycle and processes specification.
- Procedure to develop heat treatment process SOP.

Skills:

- Implement heat treatment cycle and processes.
- Validate equipment operational safety and maintenance.
- Develop and implement maintaining method for heat treatment process.
- Liaise with metallurgist and laboratory staff.
- Carry out cost analysis for forging and heat treatment process.
- Collaborate with other department to establish technology change.
- Develop work procedure, process improvement and cost saving plan.
- Provide consultation for material selection and treatment process.
- Develop product and process design specification.
- Perform SAT and uniformity check.

Attributes (Attitude/Safety/Environmental):

- Detailed understanding of how role and branch contributes to the organisation.
- Identify relationship between organisational goals and operational tasks.
- Adhere to Occupational Safety and Health Compliance Requirement.
- Ensure quality outcomes and encourage adherence to procedures.
- Manage own team, identifying and addressing performance issues as they arise.
- Prepare documents clearly and report concisely using different mediums.
- Competent with 3D CAD modelling systems with ability to draft engineering drawings.
- Demonstrate technical problem-solving abilities through experiments, analysis and systematic methods, technical documentation.

MSIC GROUP : 281 & 282
AREA : Protective Coating (Plating)
JOB TITLE : Plating Assistant Engineer
LEVEL : 4

RESPONSIBILITIES

Plating Assistant Engineer is responsible to assist in carrying out continuous improvement of the plating process on quality, on time delivery and cost. The plating engineer is part of the plating team for the development, testing and implementation of new materials and technology.

Knowledge:

- Surface treatment
- Protective coating technology
- Paint quality inspection

Skills:

- Oversee and coordinate plating operation in the plant.
- Compile plating operation data for improvement analysis.
- Implement compliance procedure based on statutory and regulatory requirements.
- Implement safety procedures for plating operation.
- Coordinate maintenance requirement for machinery related to plating operation.
- Coordinate requisition for chemical and plating materials.

Attributes (Attitude/Safety/Environmental):

- Analytical skills in solving problems.
- Accurate in performing equipment and system calculations.
- Creative in developing and designing products.
- Communicate effectively with teams.
- Work closely with staff and other department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Protective Coating (Plating)
JOB TITLE : Plating Engineer
LEVEL : 5

RESPONSIBILITIES

Plating Engineer is responsible to carry out continuous improvement of the plating process on quality, on time delivery and cost. The plating engineer is part of the plating team for the development, testing and implementation of new materials and technology.

Knowledge:

- Surface treatment
- Protective coating technology
- Paint quality inspection

Skills:

- Analyse plating solutions.
- Develop strategic plans for plating equipment maintenance.
- Develop standards for current and future plating activities.
- Plan and manage environmental policies, procedures, work instructions and requirements.
- Determine process limits based on experimentation and analysis.
- Develop new processes, methods, and layouts to increase equipment flexibility and improve manufacturing yields.

Attributes (Attitude/Safety/Environmental):

- Detailed understanding of how role and branch contributes to the organisation.
- Identify relationship between organisational goals and operational tasks.
- Ensure quality outcomes and encourage adherence to procedures.
- Manage own team, identifying and addressing performance issues as they arise.
- Prepare documents clearly and report concisely using different mediums.
- Competent with 3D CAD modelling systems with ability to draft engineering drawings.
- Demonstrate technical problem-solving abilities through experiments, analysis and systematic methods, technical documentation.
- Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Industrial Engineering
JOB TITLE : Industrial Assistant Engineer
LEVEL : 4

RESPONSIBILITIES

Industrial Assistant Engineer is responsible to assist in designing efficient systems that integrate workers, information, machines, energy and materials to make products or provide services. They will also assist in designing equipment to coordinate production planning to minimize production issues and costs while ensuring products meet quality standards and make sure the company complies with all industry standards for safety while meeting design standards and guidelines.

Knowledge:

- Production process
- Machines and tools
- Engineering design
- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Finite Element Analysis (FEA)
- Machining Process
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value

Skills:

- Perform analytic tests, collecting and analysing data.
- Provide problem solution.
- Perform a cost-benefit analysis for each project.
- Ensure safety and effectiveness.
- Conduct inspections and safety test.
- Prepare production schedules.
- Assist in developing management controls system.
- Assist in design control systems.
- Coordinate operation for manufacture parts or products.
- Assist in develop standards for design and production.

Attributes (Attitude/Safety/Environmental):

- Critical thinking skills in solving problems related to waste and inefficiency.
- Listening skills when obtaining feedback from client.

- Problem solving skills in designing facilities for manufacturing and processes for providing services.
- Speaking skills in explaining their instructions to production staff or technician.
- Creative and ingenuity to design new production process.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Industrial Engineering
JOB TITLE : Industrial Engineer
LEVEL : 5

RESPONSIBILITIES

Industrial Engineer is responsible to prevent waste and inefficiency in production processes. They will design efficient systems that integrate workers, information, machines, energy and materials to make products or provide services. The industrial engineer will also design equipment to coordinate production planning to minimize production issues and costs while ensuring products meet quality standards. They will design, develop and maintain manufacturing routes to maximize effectiveness, efficiency and space. The industrial engineer will also make sure the company complies with all industry standards for safety while meeting design standards and guidelines. They will also work in a support role as needed on less complex projects.

Knowledge:

- Production process
- Machines and tools
- Engineering design
- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Finite Element Analysis (FEA)
- Machining Process
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value

Skills:

- Review production information.
- Design control systems.
- Create system and plan production.
- Develop standards for production and design.
- Review production schedules, engineering specifications, process flows, and other information.
- Plan operation for manufacture parts or products.
- Develop management control systems.
- Enact quality control procedures to resolve production problems or minimize costs.
- Develop standards for design and production.
- Design control systems to coordinate activities and production planning.

Attributes (Attitude/Safety/Environmental):

- Critical thinking skills in solving problems related to waste and inefficiency.
- Listening skills when obtaining feedback from client.
- Analytical skills in creating production process efficiency.
- Problem solving skills in designing facilities for manufacturing and processes for providing services.
- Speaking skills in explaining their instructions to production staff or technician.
- Leadership and People Management.
- Creative and ingenuity to design new production process.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : M&E Fabrication, Assembly and Repair (Electrical)
JOB TITLE : Electrical Technician
LEVEL : 2

RESPONSIBILITIES

Electrical Technician is responsible to install, maintain, and repair electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service street lights, intercom systems, or electrical control systems.

Knowledge:

- Types and function of electrical component
- Electrical component specification
- Cable laying procedure
- Cable arrangement
- Interpretation of design drawing
- Maintenance procedures for electrical system
- Occupational Safety and Health Compliance Requirement
- Related statutory and regulatory compliance requirement
- Interpretation of Wiring Circuit Diagram
- Electrical Measuring instrument
- Machining Process
- Electrical Power
- Electrical Wiring

Skills:

- Interpret design drawing.
- Prepare installation, maintenance and inspection tools and equipment.
- Identify electrical component specification.
- Carry out assembly of electrical component.
- Carry out cable laying as per diagram.
- Assist in testing activities for electrical system.
- Conduct functionality test for electrical system.
- Carry out preventive and corrective for machine and equipment maintenance.
- Carry out machine parameter setting.
- Record machine operation checklist.
- Prepare machine operation report.

Attributes (Attitude/Safety/Environmental):

- Meticulous in preparing work report.
- Communicate effectively with team work and client.
- Creative in solving problems.

- Relation with another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : M&E Fabrication, Assembly and Repair (Electrical)
JOB TITLE : Electrical Supervisor
LEVEL : 3

RESPONSIBILITIES

Electrical Supervisor is responsible to supervise installation, maintaining, and repairing electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service street lights, intercom systems, or electrical control systems.

Knowledge:

- Interpretation of Wiring Circuit Diagram
- Electrical Measuring instrument
- Machining Process
- Electrical Power
- Electrical Wiring

Skills:

- Manage the electrical maintenance work force.
- Prepare maintenance operation scheduling.
- Ensure that all data collected regarding work process is accurate and complete when being entered into data bank.
- Coordinate installation, maintenance and inspection tools and equipment preparation.
- Confirm electrical component assembly.
- Confirm functionality test result for electrical system.
- Prepare and coordinate preventive and corrective for machine and equipment maintenance activities.
- Confirm machine parameter setting.
- Perform supervisory function.

Attributes (Attitude/Safety/Environmental):

- Communicate effectively with team work and client.
- Creative in solving problems.
- Relation with another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : M&E Fabrication, Assembly and Repair (Electrical)
JOB TITLE : Electrical Assistant Engineer
LEVEL : 4

RESPONSIBILITIES

Electrical Assistant Engineer is responsible to assist in designing electrical systems by developing and testing component. They also responsible to planning and managing electrical operation activities.

Knowledge:

- Machining Process
- Autonomous Maintenance
- Root cause analysis
- Total Quality Management (TQM)
 - Quality Management System (QMS)
 - Lean Manufacturing

Skills:

- Assist electrical engineer in installation and maintenances of electrical systems.
- Provide administrative assistance.
- Identify action items and work with the engineering team to close them.
- Work with the engineering team to plan, coordinate and execute electrical projects.
- Review project specifications and identify technical constraints and requirements.
- Prepare technical design documents based on project specifications.
- Identify electrical system integration and design issues.
- Monitor and report project status to management on regular basis.
- Supervise project activities to ensure timely completion.
- Check project deliverables meet quality standards and customer specifications.
- Provide technical guidance to project team when needed.
- Schedule routine maintenance and inspection of electrical systems.
- Develop preventive maintenance programs for electrical systems.
- Ensure that system breakdowns, failures and repairs are addressed promptly.

Attributes (Attitude/Safety/Environmental):

- Analytical skills in solving problems.
- Accurate in performing equipment and system calculations.
- Creative in developing and designing products.
- Communicate effectively with teams.
- Work closely with staff and other department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : M&E Fabrication, Assembly and Repair (Electrical)
JOB TITLE : Electrical Engineer
LEVEL : 5

RESPONSIBILITIES

Electrical Engineer is responsible to design electrical systems by developing and testing component. They also responsible to planning and managing electrical operation activities

Knowledge:

- Machining Process
- Autonomous Maintenance
- Root cause analysis
- Total Quality Management (TQM)
 - Quality Management System (QMS)
 - Lean Manufacturing

Skills:

- Schedule and undertake periodic maintenance on all electrical equipment, components, and installations.
- Provide prompt response to inquiries whenever there is a breakdown, and resolve the issue as quickly as possible.
- Perform installation of fresh electrical components and fittings.
- Recommend replacement for old or faulty electrical components or fittings to the management.
- Assist in forecasting requirements, creating a budget and scheduling expenses for the electrical system.
- Keep record of all stock and supplies, including company's electrical equipment.
- Perform energy audit and recommend alternative sources of energy.
- Troubleshoot machine breakdowns and provide preventive maintenance services.

Attributes (Attitude/Safety/Environmental):

- Identify risk, undertake risk assessments and manage risks accordingly.
- Practical knowledge in mechanical design including machinery tooling designs.
- Detailed understanding of how role and branch contributes to the organisation.
- Identify relationship between organisational goals and operational tasks.
- Ensure quality outcomes and encourage adherence to procedures.
- Manage own team, identifying and addressing performance issues as they arise.
- Competent with 3D CAD modelling systems with ability to draft engineering drawings.
- Demonstrate technical problem-solving abilities through experiments, analysis and systematic methods, technical documentation.
- Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : M&E Fabrication, Assembly and Repair (Electronic)
JOB TITLE : Electronic Assistant Engineer
LEVEL : 4

RESPONSIBILITIES

Electronic Assistant Engineer is responsible to assist in research, design, develop, and test electronic components and systems for commercial, industrial, military, or scientific use utilising knowledge of electronic theory and materials properties. Design electronic circuits and components for use in fields such as telecommunications, aerospace guidance and propulsion control, acoustics, or instruments and controls.

Knowledge:

- Autonomous Maintenance
- Root cause analysis
- Total Quality Management (TQM)
- Embedded System Programming
- Network and Communication Protocol
- Automation Engineering
- Circuit Diagram
- Sensoring and Image Processing

Skills:

- Assist electronic engineer in installation and maintenances of electronic and control systems.
- Provide administrative assistance.
- Identify action items and work with the engineering team to close them.
- Work with the engineering team to plan, coordinate and execute electrical projects.
- Review project specifications and identify technical constraints and requirements.
- Prepare technical design documents based on project specifications.
- Identify electronic and control system integration and design issues.
- Monitor and report project status to management on regular basis.
- Supervise project activities to ensure timely completion.
- Check project deliverables meet quality standards and customer specifications.
- Provide technical guidance to project team when needed.
- Schedule routine maintenance and inspection of electrical systems.
- Develop preventive maintenance programs for electrical systems.
- Ensure that system breakdowns, failures and repairs are addressed promptly.

Attributes (Attitude/Safety/Environmental):

- Analytical skills in solving problems.
- Accurate in performing equipment and system calculations.
- Creative in developing and designing products.
- Communicate effectively with teams.
- Work closely with staff and other department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : M&E Fabrication, Assembly and Repair (Electronic)
JOB TITLE : Electronic Engineer
LEVEL : 5

RESPONSIBILITIES

Electronic Engineer is responsible to research, design, develop, and test electronic components and systems for commercial, industrial, military, or scientific use utilising knowledge of electronic theory and materials properties. Design electronic circuits and components for use in fields such as telecommunications, aerospace guidance and propulsion control, acoustics, or instruments and controls.

Knowledge:

- Autonomous Maintenance
- Root cause analysis
- Total Quality Management (TQM)
- Embedded System Programming
- Network and Communication Protocol
- Automation Engineering
- Circuit Diagram
- Sensoring and Image Processing

Skills:

- Schedule and undertake periodic maintenance on all electronic and control system, equipment, components, and installations.
- Provide prompt response to inquiries whenever there is a breakdown, and resolve the issue as quickly as possible.
- Perform installation of fresh electronic components and fittings.
- Recommend replacement for old or faulty electronic components or fittings to the management.
- Assist in forecasting requirements, creating a budget and scheduling expenses for the electronic and control system.
- Keep record of all stock and supplies, including company's electrical equipment.
- Perform energy audit and recommend alternative sources of energy.
- Troubleshoot machine breakdowns and provide preventive maintenance services.

Attributes (Attitude/Safety/Environmental):

- Identify risk, undertake risk assessments and manage risks accordingly.
- Practical knowledge in mechanical design including machinery tooling designs.
- Detailed understanding of how role and branch contributes to the organisation.
- Ensure quality outcomes and encourage adherence to procedures.

- Manage own team, identifying and addressing performance issues as they arise.
- Prepare documents clearly and report concisely.
- Competent with 3D CAD modelling systems with ability to draft engineering drawings.
- Demonstrate technical problem-solving abilities through experiments, analysis and systematic methods, technical documentation.
- Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : M&E Fabrication, Assembly and Repair (Mechanical)
JOB TITLE : Mechanical Technician
LEVEL : 2

RESPONSIBILITIES

Mechanical Technician is responsible to assemble or fabricate mechanical parts, pieces or products using a variety of tools and equipment according to required specifications in a specific area of a production line in a manufacturing organisation.

Knowledge:

- Machining Process
- Overall Equipment Effectiveness (OEE)
- Statistical Process Control (SPC)
- Autonomous Maintenance
- Root cause analysis
- Engineering Design
- Total Quality Management (TQM)
- Machine Load Balancing
- Numerical Control

Skills:

- Check equipment and operating systems.
- Ensure mechanical operations, standards and controls are maintained.
- Resolve motor, pump, conveyor and hydraulic problems.
- Repair and perform preventive maintenance as per established standards.
- Handle personal tools for job including up-to-date documented personal tool lists.
- Handle time accounting and complete work order.

Attributes (Attitude/Safety/Environmental):

- Meticulous in preparing work report.
- Communicate effectively with team work and client.
- Creative in solving problems.
- Relation with another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : M&E Fabrication, Assembly and Repair (Mechanical)
JOB TITLE : Mechanical Supervisor
LEVEL : 3

RESPONSIBILITIES

Mechanical Supervisor is responsible to supervise and monitor assembling or fabricating mechanical parts, pieces or products using a variety of tools and equipment according to required specifications in a specific area of a production line in a manufacturing organisation.

Knowledge:

- Machining Process
- Overall Equipment Effectiveness (OEE)
- Statistical Process Control (SPC)
- Autonomous Maintenance
- Root cause analysis
- Engineering Design
- Total Quality Management (TQM)
- Machine Load Balancing
- Numerical Control

Skills:

- Inspect mechanics' repairs and installations.
- Maintain parts inventory.
- Ensure compliance with safety practices.
- Evaluate mechanics work and performance.
- Prepare maintenance operation scheduling.
- Ensure that all data collected regarding work process is accurate and complete.
- Coordinate installation, maintenance and inspection tools and equipment preparation.
- Confirm mechanical component assembly.
- Prepare and coordinate preventive and corrective for machine and equipment maintenance activities.
- Confirm machine parameter setting.
- Perform supervisory function.

Attributes (Attitude/Safety/Environmental):

- Communicate effectively with team work and client.
- Creative in solving problems.
- Relation with another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : M&E Fabrication, Assembly and Repair (Mechanical)
JOB TITLE : Mechanical Assistant Engineer
LEVEL : 4

RESPONSIBILITIES

Mechanical Assistant Engineer is responsible to assist in designing and planning mechanical and electromechanical products and systems by developing and testing specifications and methods.

Knowledge:

- Machining Process
- Overall Equipment Effectiveness (OEE)
- Statistical Process Control (SPC)
- Autonomous Maintenance
- Root cause analysis
- Engineering Design
- Total Quality Management (TQM)
- Machine Load Balancing
- Hydraulic and Pneumatic System
- Numerical Control

Skills:

- Assist mechanical engineer in installation and maintenances of mechanical systems.
- Provide administrative assistance.
- Identify action items and work with the engineering team to close them.
- Work with the engineering team to plan, coordinate and execute mechanical projects.
- Review project specifications and identify technical constraints and requirements.
- Prepare technical design documents based on project specifications.
- Identify mechanical system integration and design issues.
- Monitor and report project status to management on regular basis.
- Supervise project activities to ensure timely completion.
- Check project deliverables meet quality standards and customer specifications.
- Provide technical guidance to project team when needed.
- Schedule routine maintenance and inspection of mechanical systems.
- Develop preventive maintenance programs for mechanical systems.
- Ensure that system breakdowns, failures and repairs are addressed promptly.

Attributes (Attitude/Safety/Environmental):

- Analytical skills in solving problems.
- Ensure designs meet legal guidelines and safety requirements.
- Accurate in performing equipment and system calculations.

- Creative in developing and designing products.
- Communicate effectively with teams.
- Work closely with staff and other department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : M&E Fabrication, Assembly and Repair (Mechanical)
JOB TITLE : Mechanical Engineer
LEVEL : 5

RESPONSIBILITIES

Mechanical Engineer is responsible to design and planning mechanical and electromechanical products and systems by developing and testing specifications and methods.

Knowledge:

- Machining Process
- Overall Equipment Effectiveness (OEE)
- Statistical Process Control (SPC)
- Autonomous Maintenance
- Root cause analysis
- Engineering Design
- Total Quality Management (TQM)
- Machine Load Balancing
- Hydraulic and Pneumatic System
- Numerical Control

Skills:

- Prepare and evaluate product specification including material specification, BOM list and design drawing.
- Determine machine operation requirements and machining process.
- Carry out resources planning for production requirements including for method, manpower and machinery & equipment.
- Carry out machine parameter setting according to product specification.
- Carry out machining activities.
- Plan CNC machine operation.
- Identify process improvement requirement.
- Conduct Overall Equipment Effectiveness (OEE) analysis.
- Carry out Factory Acceptance Test (FAT) and Site Acceptance Test (SAT) based on determined requirements.

Attributes (Attitude/Safety/Environmental):

- Identify risk, undertake risk assessments and manage risks accordingly.
- Practical knowledge in mechanical design including machinery tooling designs.
- Detailed understanding of how role and branch contributes to the organisation.
- Identify relationship between organisational goals and operational tasks.
- Ensure quality outcomes and encourage adherence to procedures.
- Manage own team, identifying and addressing performance issues as they arise.

- Prepare documents clearly and report concisely.
- Competent with 3D CAD modelling systems with ability to draft engineering drawings.
- Demonstrate technical problem-solving abilities through experiments, analysis and systematic methods, technical documentation.
- Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Manufacture of Machinery and Equipment Quality Management
- Quality Control
JOB TITLE : Quality Control Assistant Engineer
LEVEL : 4

RESPONSIBILITIES

Quality Control Assistant Engineer is responsible to assist in ensuring that the product being manufactured clears all the parameters of quality. They also have to use the most suitable production techniques that can help the company in reducing production cost and energy that too with the help of less workforce and they also have to maintain quality, and durability in products.

Knowledge:

- Total Quality Management (TQM)
- Process Engineering
- Jig and fixtures
- Measurement methodology
- Data Sampling Technique
- Documentation control

Skills:

- Perform product incoming material inspection.
- Carry out product in-process line inspection.
- Carry out product secondary process inspection.
- Execute product sampling and testing
- Analyse product inspection verification report.
- Implement product documentation and control.
- Implement quality management implementation and control procedure.

Attributes (Attitude/Safety/Environmental):

- Clear and accurate written and verbal communication.
- Negotiate confidently in a clear and concise manner.
- Identify learning opportunities for others and delegate tasks effectively.
- Practical knowledge in mechanical design including machinery tooling designs.
- Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Manufacture of Machinery and Equipment Quality Management
- Quality Control
JOB TITLE : Quality Control Engineer
LEVEL : 5

RESPONSIBILITIES

Quality Control Engineer is responsible to ensure that the product being manufactured clears all the parameters of quality. These engineers have to use the most suitable production techniques that can help the company in reducing production cost and energy that too with the help of less workforce. The main responsibilities also to maintain quality, and durability in products.

Knowledge:

- Overall Equipment Effectiveness (OEE)
- Statistical Process Control (SPC)
- Autonomous Maintenance
- Root cause analysis
- Engineering Design
- Total Quality Management (TQM)
 - Quality Management System (QMS)
 - Lean Manufacturing
 - Poka yoke
 - Kaizen
 - 6 Sigma

Skills:

- Create and maintaining the Company's Quality Standards.
- Develop, implement and maintain the Company's quality documentation, such as quality procedures, reports etc.
- Establishing, implementing and maintaining the quality awareness throughout the various departments.
- Work with cross-functional teams to generate Manufacturing Inspection Test Plans.
- Inspect to ensure that products and processes comply with requirements, using established engineering techniques.
- Conduct audits, creating audits finding reports and determine proper corrective and preventive actions.
- Analyse the root causes and implement corrective actions for processes or parts.

Attributes (Attitude/Safety/Environmental):

- Identify risk, undertake risk assessments and manage risks accordingly.
- Practical knowledge in mechanical design including machinery tooling designs.
- Detailed understanding of how role and branch contributes to the organisation.
- Identify relationship between organisational goals and operational tasks.
- Ensure quality outcomes and encourage adherence to procedures.
- Manage own team, identifying and addressing performance issues as they arise.
- Prepare documents clearly and report concisely.
- Competent with 3D CAD modelling systems with ability to draft engineering drawings.
- Demonstrate technical problem-solving abilities through experiments, analysis and systematic methods, technical documentation.
- Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Manufacture of Machinery and Equipment Quality Management
- Quality Assurance
JOB TITLE : Quality Assurance Assistant Engineer
LEVEL : 4

RESPONSIBILITIES

Quality Assurance Assistant Engineer is responsible to assist in assessing the quality of specifications and technical design documents in order to ensure timely, relevant and meaningful feedback. They are involved in planning and implementing strategies for quality management and testing.

Knowledge:

- Overall Equipment Effectiveness (OEE)
- Statistical Process Control (SPC)
- Autonomous Maintenance
- Root cause analysis
- Engineering Design
- Total Quality Management (TQM)
 - Quality Management System (QMS)
 - Lean Manufacturing
 - Poka yoke
 - Kaizen
 - 6 Sigma

Skills:

- Responsible for quality assurance for plastic production involving all products and processes.
- Implement the quality management strategy and plans.
- Promote quality achievement and performance improvement.
- Set quality assurance compliance objectives and ensuring that targets are achieved.
- Ensure compliance requirements with national and international standards and legislation are met.
- Define quality procedures in conjunction with operations and production.
- Determine relevant quality-related training needs.
- Collate and analyse performance data and charts against defined parameters.
- Ensure tests and procedures are properly understood, carried out and evaluated
- Work with customers' auditors and ensures the execution of corrective action and compliance with customers' specifications.
- Monitor performance through gathering relevant data and producing statistical reports.

- Monitor data from measurement devices and initiates corrective action based on data analysis
- Perform related audit related to production operation.

Attributes (Attitude/Safety/Environmental):

- Clear and accurate written and verbal communication.
- Negotiate confidently in a clear and concise manner.
- Identify learning opportunities for others and delegate tasks effectively.
- Practical knowledge in mechanical design including machinery tooling designs.
- Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Manufacture of Machinery and Equipment Quality Management
- Quality Assurance
JOB TITLE : Quality Assurance Engineer
LEVEL : 5

RESPONSIBILITIES

Quality Assurance Engineer is responsible to assessing the quality of specifications and technical design documents in order to ensure timely, relevant and meaningful feedback. They are involved in planning and implementing strategies for quality management and testing.

Knowledge:

- Overall Equipment Effectiveness (OEE)
- Statistical Process Control (SPC)
- Autonomous Maintenance
- Root cause analysis
- Engineering Design
- Total Quality Management (TQM)
 - Quality Management System (QMS)
 - Lean Manufacturing
 - Poka yoke
 - Kaizen
 - 6 Sigma

Skills:

- Develop and implement a quality production program to ensure conformity of purchased material and final products to quality standards.
- Maintain a high level of customer service by investigating and correcting issues and complaints relating to quality.
- Analyse statistical data and product specifications to determine standards that meet quality and reliability expectancy of finished products.
- Revise and update the quality control manual to incorporate statistical control programs.
- Work closely with vendors, customers, quality representatives, and company personnel to maximise product reliability and minimize costs.
- Develop and maintain a supplier quality index, utilizing statistical control programs, to assure that only high-quality vendors are retained.
- Prepare for and represent the company during all audits.
- Coordinate and approve all sample submissions of new products and engineering changes.
- Prepare all necessary reports as required by customers and staff personnel.
- Design, develop, and implement quality control training programs for all quality control staff.

- Supervise quality control team leads and workers to ensure high productivity and product integrity throughout the production cycle.
- Provide support and expertise to quality control teams.

Attributes (Attitude/Safety/Environmental):

- Clear and accurate written and verbal communication.
- Negotiate confidently in a clear and concise manner.
- Identify learning opportunities for others and delegate tasks effectively.
- Practical knowledge in mechanical design including machinery tooling designs.
- Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Robotic Engineering - Robot Design
JOB TITLE : Robot Making Technician
LEVEL : 3

RESPONSIBILITIES

Robot Making Technician is responsible to design, develop, build, and program robots and robotic devices, including peripheral equipment and computer software used to control robots. Robot design technicians also assist robotics engineers in a wide variety of tasks relating to the design, development, production, testing, operation, repair, and maintenance of robots and robotic devices.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Finite Element Analysis (FEA)
- Machining Process
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value

Skills:

- Install new robotic systems in stationary positions or on tracks.
- Modify computer-controlled robot movements.
- Build or assemble robotic devices or systems.
- Develop robotic path motions to maximise efficiency, safety, and quality.
- Maintain service records of robotic equipment or automated production systems.
- Fabricate housings, jigs, fittings, or fixtures, using metalworking machines.
- Attach wires between controllers.
- Assist engineers in the design, configuration, or application of robotic systems.
- Perform preventive or corrective maintenance on robotic systems or components.
- Train customers or other personnel to install, use, or maintain robots.
- Align, fit, or assemble component parts using hand tools, power tools, fixtures, templates, or microscopes.
- Install, program, or repair programmable controllers, robot controllers, end-of-arm tools, or conveyors.
- Disassemble and reassemble robots or peripheral equipment to make repairs such as replacement of defective circuit boards, sensors, controllers, encoders, and servomotors.
- Evaluate the efficiency and reliability of industrial robotic system.
- Operate robots to perform customized tasks.

Attributes (Attitude/Safety/Environmental):

- Able to determine the best solutions to technical issues and enhancement needs.
- Document and maintain accurate records.
- Identify and convey information.
- Provide support with team work.
- Work closely with another department.
- Creative in solving problems.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Robotic Engineering - Robot Design
JOB TITLE : Robot Assistant Designer
LEVEL : 4

RESPONSIBILITIES

Robot Assistant Designer is responsible to assist in designing, testing, and manufacturing industrial robots that are cost-effective and capable of performing any complex, dangerous, and dirty tasks that humans don't prefer. Proficient in collecting user information, researching and interpreting the purpose or goals of creating and manufacturing robots, and delivering the best results in budget and time.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Finite Element Analysis (FEA)
- Machining Process
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value

Skills:

- Integrate robotics with peripherals, such as welders, controllers, or other equipment.
- Make system device lists or event timing charts.
- Investigate mechanical failures or unexpected maintenance problems.
- Design end-of-arm tooling.
- Analyse and evaluate robotic systems or prototypes.
- Install, calibrate, operate, or maintain robots.
- Conduct research on robotic technology to create new robotic systems or system capabilities.
- Build, configure, and test robots.
- Document robotic application development, maintenance, or changes.
- Provide technical support for robotic systems.

Attributes (Attitude/Safety/Environmental):

- Understand robotic system, product and process.
- Creative in developing and designing products.
- Analytical skills in solving problems.
- Communicate effectively with teams.
- Understand new information or materials by studying and working with them.

- Concentrate and not be distracted while performing a task.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Robotic Engineering - Robot Design
JOB TITLE : Robot Designer
LEVEL : 5

RESPONSIBILITIES

Robot Designer is responsible to designing, testing, and manufacturing industrial robots that are cost-effective and capable of performing any complex, dangerous, and dirty tasks that humans don't prefer. Proficient in collecting user information, researching and interpreting the purpose or goals of creating and manufacturing robots, and delivering the best results in budget and time.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Finite Element Analysis (FEA)
- Machining Process
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value

Skills:

- Prepare and evaluate robot mechanical, electrical and electronic.
- Produce robot modelling design.
- Produce Electrical & Electronic Circuit Design and Electrical & Electronic Layout and Wiring Diagram Design.
- Carry out engineering, electrical and electronic system analysis.
- Produce design specification.
- Produce BOM list.
- Prepare product prototyping.
- Compile and collect design documentation.

Attributes (Attitude/Safety/Environmental):

- Understand robotic system, product and process.
- Alert with the technology change.
- Analyse ideas and use logic to determine their strengths and weaknesses.
- Creative in developing and designing products.
- Analytical skills in solving problems.
- Communicate effectively with teams.
- Understand new information or materials by studying and working with them.
- Identify what must be changed to reach goals.

- Concentrate and not be distracted while performing a task.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Robotic Engineering – Integrated Robotic System Design
JOB TITLE : Robotic Operation Operator
LEVEL : 3

RESPONSIBILITIES

Robotic Operation Operator is responsible to build, install, test or maintain robotic equipment or related automated production systems.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value
- Circuit Theory
- Finite Element Analysis (FEA)
- Machining Process
- Electronic Component Selection
- Ingress Protection rating (IP rating)
- Embedded system programming
- Networking and Communication Protocol
- Sensing and Control
- Design Modelling and Simulation
- Cybersecurity

Skills:

- Inspect installation sites.
- Install new robotic systems in stationary positions or on tracks.
- Modify computer-controlled robot movements.
- Build or assemble robotic devices or systems.
- Maintain inventories of production supplies such as sensors and cables.
- Develop robotic path motions to maximize efficiency, safety, and quality.
- Maintain service records of robotic equipment or automated production systems.
- Fabricate housings, jigs, fittings, or fixtures, using metalworking machines.
- Document robotics test procedures and results.
- Develop three-dimensional simulations of automation systems.
- Attach wires between controllers.
- Assist engineers in the design, configuration, or application of robotic systems.
- Perform preventive or corrective maintenance on robotic systems or components.
- Train customers or other personnel to install, use, or maintain robots.
- Program complex robotic systems, such as vision systems.

- Align, fit, or assemble component parts using hand tools, power tools, fixtures, templates, or microscopes.
- Troubleshoot robotic systems
- Test performance of robotic assemblies
- Install, program, or repair programmable controllers, robot controllers, end-of-arm tools, or conveyors.
- Disassemble and reassemble robots or peripheral equipment to make repairs
- Evaluate the efficiency and reliability of industrial robotic systems, reprogramming or calibrating to achieve maximum quantity and quality.
- Operate robots to perform customized tasks

Attributes (Attitude/Safety/Environmental):

- Able to determine the best solutions to technical issues and enhancement needs.
- Document and maintain accurate records.
- Identify and convey information.
- Provide support with team work.
- Work closely with another department.
- Creative in solving problems.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Robotic Engineering – Integrated Robotic System Design
JOB TITLE : Robotic System Design Assistant Engineer
LEVEL : 4

RESPONSIBILITIES

Robotic System Design Assistant Engineer is responsible to assist in researching, designing, developing or testing robotic application according to customer requirements and company procedure.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value
- Circuit Theory
- Finite Element Analysis (FEA)
- Machining Process
- Electronic Component Selection
- Ingress Protection rating (IP rating)
- Embedded system programming
- Networking and Communication Protocol
- Sensing and Control
- Design Modelling and Simulation
- Cybersecurity

Skills:

- Perform design robotic mechanical system.
- Perform design robotic sensory system design.
- Produce robotic safety system design.
- Produce robotic monitoring & control system design.
- Analyse robotic communication protocol identification and integration.
- Perform robot design integration.

Attributes (Attitude/Safety/Environmental):

- Understand robotic system, product and process.
- Creative in developing and designing products.
- Analytical skills in solving problems.
- Communicate effectively with teams.
- Concentrate and not be distracted while performing a task.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Robotic Engineering – Integrated Robotic System Design
JOB TITLE : Robotic System Design Engineer
LEVEL : 5

RESPONSIBILITIES

Robotic System Design Engineer is responsible to research, design, develop or test robotic application according to customer requirements and company procedure.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Finite Element Analysis (FEA)
- Machining Process
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value

Skills:

- Analyse automation and robotic system integration requirements.
- Perform automation and robotic system integration.
- Perform robotic system program development verification.
- Perform robotic system program integration.
- Perform Human Machine Interface (HMI) development.
- Perform autonomous module robotic programming.

Attributes (Attitude/Safety/Environmental):

- Understand robotic system, product and process.
- Alert with the technology change.
- Analyse ideas and use logic to determine their strengths and weaknesses.
- Creative in developing and designing products.
- Analytical skills in solving problems.
- Communicate effectively with teams.
- Understand new information or materials by studying and working with them.
- Identify what must be changed to reach goals.
- Concentrate and not be distracted while performing a task.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Robotic Engineering - Robotic Programming
JOB TITLE : Robotic Programmer
LEVEL : 3

RESPONSIBILITIES

Robotic Programmer is responsible to produces/modifies efficient and logical robot programs for automated liquid paint application.

Knowledge:

- Embedded system programming
- Networking and Communication Protocol
- Sensing and Control
- Cybersecurity

Skills:

- Install new robotic systems in stationary positions or on tracks.
- Modify computer-controlled robot movements.
- Build or assemble robotic devices or systems.
- Develop robotic path motions to maximize efficiency, safety, and quality.
- Maintain service records of robotic equipment or automated production systems.
- Fabricate housings, jigs, fittings, or fixtures, using metalworking machines.
- Attach wires between controllers.
- Assist engineers in the design, configuration, or application of robotic systems.
- Perform preventive or corrective maintenance on robotic systems or components.
- Train customers or other personnel to install, use, or maintain robots.
- Align, fit, or assemble component parts using hand tools, power tools, fixtures, templates, or microscopes.
- Install, program, or repair programmable controllers, robot controllers, end-of-arm tools, or conveyors.
- Disassemble and reassemble robots or peripheral equipment to make repairs such as replacement of defective circuit boards, sensors, controllers, encoders, and servomotors.
- Evaluate the efficiency and reliability of industrial robotic system.
- Operate robots to perform customised tasks.

Attributes (Attitude/Safety/Environmental):

- Able to determine the best solutions to technical issues and enhancement needs.
- Document and maintain accurate records.
- Identify and convey information.
- Provide support with team work.
- Work closely with another department.
- Creative in solving problems.

- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.
- Accurate in carrying out work activities.
- Meticulous in preparing work report
- Meticulous in identifying programming requirements.

MSIC GROUP : 281 & 282
AREA : Robotic Engineering - Robotic Programming
JOB TITLE : Robotic Lead Programmer
LEVEL : 4

RESPONSIBILITIES

Robotic Lead Programmer is responsible to assist in researching, designing and developing of robotic program according to customer requirements and company procedure.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Finite Element Analysis (FEA)
- Machining Process
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value

Skills:

- Carry out robotic system calibration.
- Perform robotic motion programming.
- Carry out robotic vision programming.
- Carry out robotic special function programming.
- Carry out robotic peripherals program integration.

Attributes (Attitude/Safety/Environmental):

- Understand robotic system, product and process.
- Creative in developing and designing products.
- Analytical skills in solving problems.
- Communicate effectively with teams.
- Understand new information or materials by studying and working with them.
- Concentrate and not be distracted while performing a task.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Robotic Engineering - Robotic Programming
JOB TITLE : Robotic Programming System Analyst
LEVEL : 5

RESPONSIBILITIES

Robotic Programming System Analyst is responsible to research, design and develop of robotic program according to customer requirements and company procedure.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Finite Element Analysis (FEA)
- Machining Process
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value

Skills:

- Perform autonomous module robotic programming.
- Develop human machine interface (HMI).
- Execute robotic system program integration.
- Perform verification of robotic system program development.
- Verify robotic system calibration.
- Perform robotic motion programming.
- Perform robotic vision programming.
- Perform robotic special function programming.
- Carry out robotic peripherals program integration.

Attributes (Attitude/Safety/Environmental):

- Understand robotic system, product and process.
- Alert with the technology change.
- Analyse ideas and use logic to determine their strengths and weaknesses.
- Creative in developing and designing products.
- Analytical skills in solving problems.
- Communicate effectively with teams.
- Understand new information or materials by studying and working with them.
- Identify what must be changed to reach goals.
- Concentrate and not be distracted while performing a task.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Robotic Engineering - Robotic Operation Control & Maintenance
JOB TITLE : Robotic Operation Operator
LEVEL : 3

RESPONSIBILITIES

Robotic Operation Operator is responsible to performs daily testing activities on the robot integrated work cells as per documented procedures & under supervision.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value
- Circuit Theory
- Finite Element Analysis (FEA)
- Machining Process
- Electronic Component Selection
- Ingress Protection rating (IP rating)
- Embedded system programming
- Networking and Communication Protocol
- Sensing and Control
- Design Modelling and Simulation
- Cybersecurity

Skills:

- Install new robotic systems in stationary positions or on tracks.
- Modify computer-controlled robot movements.
- Build or assemble robotic devices or systems.
- Develop robotic path motions to maximize efficiency, safety, and quality.
- Maintain service records of robotic equipment or automated production systems.
- Fabricate housings, jigs, fittings, or fixtures, using metalworking machines.
- Attach wires between controllers.
- Assist engineers in the design, configuration, or application of robotic systems.
- Perform preventive or corrective maintenance on robotic systems or components.
- Train customers or other personnel to install, use, or maintain robots.
- Align, fit, or assemble component parts using hand tools, power tools, fixtures, templates, or microscopes.
- Install, program, or repair programmable controllers, robot controllers, end-of-arm tools, or conveyors.

- Disassemble and reassemble robots or peripheral equipment to make repairs such as replacement of defective circuit boards, sensors, controllers, encoders, and servomotors.
- Evaluate the efficiency and reliability of industrial robotic system.
- Operate robots to perform customised tasks.

Attributes (Attitude/Safety/Environmental):

- Able to determine the best solutions to technical issues and enhancement needs.
- Document and maintain accurate records.
- Identify and convey information.
- Provide support with team work.
- Work closely with another department.
- Creative in solving problems.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.
- Relation with another department.

MSIC GROUP : 281 & 282
AREA : Robotic Engineering - Robotic Operation Control & Maintenance
JOB TITLE : Robotic Operation Assistant Engineer
LEVEL : 4

RESPONSIBILITIES

Robotic Operation Assistant Engineer is responsible to coordinate and monitor daily testing activities on the robot integrated work cells as per documented procedures & under supervision.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value
- Circuit Theory
- Finite Element Analysis (FEA)
- Machining Process
- Electronic Component Selection
- Ingress Protection rating (IP rating)
- Embedded system programming
- Networking and Communication Protocol
- Sensing and Control
- Design Modelling and Simulation
- Cybersecurity

Skills:

- Assist in designing, building and sustaining of manufacturing cells.
- Initiate opportunities for robotic system equipment to reduce waste and increase efficiency.
- Conduct equipment design reviews and provide input guidance to robotic design team.
- Manage day to day robotic operation in the plant.
- Supervise installation and testing to verify requirements and specifications are met.
- Coordinate maintenance requirement for robotic system based on determined operation guidelines.

Attributes (Attitude/Safety/Environmental):

- Understand robotic system, product and process.
- Creative in developing and designing products.
- Analytical skills in solving problems.
- Communicate effectively with teams.
- Understand new information or materials by studying and working with them.

- Concentrate and not be distracted while performing a task.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Robotic Engineering - Robotic Operation Control & Maintenance
JOB TITLE : Robot Operation Engineer
LEVEL : 5

RESPONSIBILITIES

Robot Operation Engineer is responsible to verify and evaluate daily testing activities on the robot integrated work cells as per documented procedures & under supervision.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Finite Element Analysis (FEA)
- Machining Process
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value

Skills:

- Assist in designing, building and sustaining of manufacturing cells.
- Initiating opportunities for robotic system equipment to reduce waste and increase efficiency.
- Conduct equipment design reviews and provide input guidance to robotic design team.
- Manage day to day robotic operation in the plant.
- Supervise installation and testing to verify requirements and specifications are met.
- Coordinate maintenance requirement for robotic system based on determined operation guidelines.

Attributes (Attitude/Safety/Environmental):

- Understand robotic system, product and process.
- Alert with the technology change.
- Analyse ideas and use logic to determine their strengths and weaknesses.
- Creative in developing and designing products.
- Analytical skills in solving problems.
- Communicate effectively with teams.
- Understand new information or materials by studying and working with them.
- Identify what must be changed to reach goals.
- Concentrate and not be distracted while performing a task.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Automation System Engineering (Electrical)
JOB TITLE : Electrical Technician
LEVEL : 2

RESPONSIBILITIES

Electrical Technician is responsible to install, maintain, and repair electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service street lights, intercom systems, or electrical control systems.

Knowledge:

- Interpretation of Wiring Circuit Diagram
- Electrical Measuring instrument
- Machining Process
- Electrical Power
- Electrical Wiring

Skills:

- Interpret design drawing.
- Prepare installation, maintenance and inspection tools and equipment.
- Identify electrical component specification.
- Carry out assembly of electrical component.
- Carry out cable laying as per diagram.
- Assist in testing activities for electrical system.
- Conduct functionality test for electrical system.
- Carry out preventive and corrective for machine and equipment maintenance.
- Carry out machine parameter setting.
- Record machine operation checklist.
- Prepare machine operation report.

Attributes (Attitude/Safety/Environmental):

- Communicate effectively with team work and client.
- Creative in solving problems.
- Understand overall electrical problems and investigate ways to fix them.
- Relation with another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Automation System Engineering (Electrical)
JOB TITLE : Electrical Supervisor
LEVEL : 3

RESPONSIBILITIES

Electrical Supervisor is responsible to supervise installation, maintaining, and repairing electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service street lights, intercom systems, or electrical control systems.

Knowledge:

- Interpretation of Wiring Circuit Diagram
- Electrical Measuring instrument
- Machining Process
- Electrical Power
- Electrical Wiring

Skills:

- Manages the electrical maintenance work force.
- Prepare maintenance operation scheduling.
- Ensures that all data collected regarding work process is accurate and complete when being entered into data bank.
- Coordinate installation, maintenance and inspection tools and equipment preparation.
- Verify electrical component assembly.
- Verify functionality test result for electrical system.
- Prepare and coordinate preventive and corrective for machine and equipment maintenance activities.
- Verify machine parameter setting.
- Perform supervisory function.

Attributes (Attitude/Safety/Environmental):

- Communicate effectively with team work and client.
- Creative in solving problems.
- Understand overall electrical problems and investigate ways to fix them.
- Relation with another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Automation System Engineering (Electrical)
JOB TITLE : Electrical Assistant Engineer
LEVEL : 4

RESPONSIBILITIES

Electrical Assistant Engineer is responsible to assist in designing electrical systems by developing and testing component. They also responsible to planning and managing electrical operation activities.

Knowledge:

- Machining Process
- Autonomous Maintenance
- Root cause analysis
- Total Quality Management (TQM)
 - Quality Management System (QMS)
 - Lean Manufacturing

Skills:

- Assist electrical engineer in installation and maintenances of electrical systems.
- Provide administrative assistance.
- Identify action items and work with the engineering team to close them.
- Work with the engineering team to plan, coordinate and execute electrical projects.
- Review project specifications and identify technical constraints and requirements.
- Prepare technical design documents based on project specifications.
- Identify electrical system integration and design issues.
- Monitor and report project status to management on regular basis.
- Supervise project activities to ensure timely completion.
- Ensure project deliverables meet quality standards and customer specifications.
- Provide technical guidance to project team when needed.
- Schedule routine maintenance and inspection of electrical systems.
- Develop preventive maintenance programs for electrical systems.
- Ensure that system breakdowns, failures and repairs are addressed promptly.

Attributes (Attitude/Safety/Environmental):

- Analytical skills in solving problems.
- Ensure designs meet legal guidelines and safety requirements.
- Accurate in performing equipment and system calculations.
- Creative in developing and designing products.
- Communicate effectively with teams.
- Work closely with staff and another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Automation System Engineering (Electrical)
JOB TITLE : Electrical Engineer
LEVEL : 5

RESPONSIBILITIES

Electrical Engineer is responsible to design electrical systems by developing and testing component. They also responsible to planning and managing electrical operation activities

Knowledge:

- Machining Process
- Autonomous Maintenance
- Root cause analysis
- Total Quality Management (TQM)
 - Quality Management System (QMS)
 - Lean Manufacturing

Skills:

- Schedule and undertake periodic maintenance on all electrical equipment, components, and installations.
- Provide prompt response to inquiries whenever there is a breakdown, and resolve the issue as quickly as possible.
- Perform installation of fresh electrical components and fittings.
- Recommend replacement for old or faulty electrical components or fittings to the management.
- Assist in forecasting requirements, creating a budget and scheduling expenses for the electrical system.
- Keep record of all stock and supplies, including company's electrical equipment.
- Perform energy audit and recommend alternative sources of energy.
- Troubleshoot machine breakdowns and provide preventive maintenance services.

Attributes (Attitude/Safety/Environmental):

- Analytical skills in solving problems.
- Ensure designs meet legal guidelines and safety requirements.
- Accurate in performing equipment and system calculations.
- Creative in developing and designing products.
- Communicate effectively with teams.
- Work closely with staff and another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Automation System Engineering (Electronic)
JOB TITLE : Electronic Assistant Engineer
LEVEL : 4

RESPONSIBILITIES

Electronic Assistant Engineer is responsible to assist in research, design, develop, and test electronic components and systems for commercial, industrial, military, or scientific use utilising knowledge of electronic theory and materials properties. Design electronic circuits and components for use in fields such as telecommunications, aerospace guidance and propulsion control, acoustics, or instruments and controls.

Knowledge:

- Autonomous Maintenance
- Root cause analysis
- Total Quality Management (TQM)
- Embedded System Programming
- Network and Communication Protocol
- Automation Engineering
- Circuit Diagram
- Sensoring and Image Processing

Skills:

- Assist electronic engineer in installation and maintenances of electronic and control systems.
- Provide administrative assistance
- Identify action items and work with the engineering team to close them.
- Work with the engineering team to plan, coordinate and execute electrical projects.
- Review project specifications and identify technical constraints and requirements.
- Prepare technical design documents based on project specifications.
- Identify electronic and control system integration and design issues
- Monitor and report project status to management on regular basis.
- Supervise project activities to ensure timely completion.
- Ensure project deliverables meet quality standards and customer specifications.
- Provide technical guidance to project team when needed.
- Schedule routine maintenance and inspection of electrical systems.
- Develop preventive maintenance programs for electrical systems.
- Ensure that system breakdowns, failures and repairs are addressed promptly.

Attributes (Attitude/Safety/Environmental):

- Analytical skills in solving problems.
- Ensure designs meet legal guidelines and safety requirements.
- Accurate in performing equipment and system calculations.
- Creative in developing and designing products.
- Communicate effectively with teams.
- Work closely with staff and another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Automation System Engineering (Electronic)
JOB TITLE : Electronic Engineer
LEVEL : 5

RESPONSIBILITIES

Electronic Engineer is responsible to research, design, develop, and test electronic components and systems for commercial, industrial, military, or scientific use utilising knowledge of electronic theory and materials properties. Design electronic circuits and components for use in fields such as telecommunications, aerospace guidance and propulsion control, acoustics, or instruments and controls.

Knowledge:

- Autonomous Maintenance
- Root cause analysis
- Total Quality Management (TQM)
- Embedded System Programming
- Network and Communication Protocol
- Automation Engineering
- Circuit Diagram
- Sensoring and Image Processing

Skills:

- Schedule and undertake periodic maintenance on all electronic and control system, equipment, components, and installations.
- Provide prompt response to inquiries whenever there is a breakdown, and resolve the issue as quickly as possible
- Perform installation of fresh electronic components and fittings.
- Recommend replacement for old or faulty electronic components or fittings to the management.
- Assist in forecasting requirements, creating a budget and scheduling expenses for the electronic and control system.
- Keep record of all stock and supplies, including company's electrical equipment.
- Perform energy audit and recommend alternative sources of energy.
- Troubleshoot machine breakdowns and provide preventive maintenance services.

Attributes (Attitude/Safety/Environmental):

- Analytical skills in solving problems.
- Ensure designs meet legal guidelines and safety requirements.
- Accurate in performing equipment and system calculations.
- Creative in developing and designing products.

- Communicate effectively with teams.
- Work closely with staff and another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Automation System Engineering (Mechanical)
JOB TITLE : Mechanical Technician
LEVEL : 2

RESPONSIBILITIES

Mechanical Technician is responsible to assemble or fabricate mechanical parts, pieces or products using a variety of tools and equipment according to required specifications in a specific area of a production line in a manufacturing organisation.

Knowledge:

- Machining Process
- Overall Equipment Effectiveness (OEE)
- Statistical Process Control (SPC)
- Autonomous Maintenance
- Root cause analysis
- Engineering Design
- Total Quality Management (TQM)
- Machine Load Balancing
- Numerical Control

Skills:

- Check equipment and operating systems.
- Ensure mechanical operations, standards and controls are maintained.
- Resolve motor, pump, conveyor and hydraulic problems.
- Repair and perform preventive maintenance as per established standards.
- Handle personal tools for job including up-to-date documented personal tool lists.
- Handle time accounting and complete work order.

Attributes (Attitude/Safety/Environmental):

- Communicate effectively with team work and client.
- Creative in solving problems.
- Understand overall mechanical problems and investigate ways to fix them.
- Relation with another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Automation System Engineering (Mechanical)
JOB TITLE : Mechanical Supervisor
LEVEL : 3

RESPONSIBILITIES

Mechanical Supervisor is responsible to supervise and monitor assembling or fabricating mechanical parts, pieces or products using a variety of tools and equipment according to required specifications in a specific area of a production line in a manufacturing organisation.

Knowledge:

- Machining Process
- Overall Equipment Effectiveness (OEE)
- Statistical Process Control (SPC)
- Autonomous Maintenance
- Root cause analysis
- Engineering Design
- Total Quality Management (TQM)
- Machine Load Balancing
- Numerical Control

Skills:

- Inspect mechanics' repairs and installations.
- Maintain parts inventory.
- Ensure compliance with safety practices.
- Evaluate mechanics work and performance.
- Prepare maintenance operation scheduling.
- Ensures that all data collected regarding work process is accurate and complete.
- Coordinate installation, maintenance and inspection tools and equipment preparation.
- Confirm mechanical component assembly.
- Prepare and coordinate preventive and corrective for machine and equipment maintenance activities.
- Confirm machine parameter setting.
- Perform supervisory function.

Attributes (Attitude/Safety/Environmental):

- Communicate effectively with team work and client.
- Creative in solving problems.
- Understand overall mechanical problems and investigate ways to fix them.
- Relation with another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Automation System Engineering (Mechanical)
JOB TITLE : Mechanical Assistant Engineer
LEVEL : 4

RESPONSIBILITIES

Mechanical Assistant Engineer is responsible to assist in designing and planning mechanical and electromechanical products and systems by developing and testing specifications and methods.

Knowledge:

- Machining Process
- Overall Equipment Effectiveness (OEE)
- Statistical Process Control (SPC)
- Autonomous Maintenance
- Root cause analysis
- Engineering Design
- Total Quality Management (TQM)
- Machine Load Balancing
- Hydraulic and Pneumatic System
- Numerical Control

Skills:

- Assist mechanical engineer in installation and maintenances of mechanical systems.
- Provide administrative assistance
- Identify action items and work with the engineering team to close them.
- Work with the engineering team to plan, coordinate and execute mechanical projects.
- Review project specifications and identify technical constraints and requirements.
- Prepare technical design documents based on project specifications.
- Identify mechanical system integration and design issues.
- Monitor and report project status to management on regular basis.
- Supervise project activities to ensure timely completion.
- Ensure project deliverables meet quality standards and customer specifications.
- Provide technical guidance to project team when needed.
- Schedule routine maintenance and inspection of mechanical systems.
- Develop preventive maintenance programs for mechanical systems.
- Ensure that system breakdowns, failures and repairs are addressed promptly.

Attributes (Attitude/Safety/Environmental):

- Analytical skills in solving problems.
- Ensure designs meet legal guidelines and safety requirements.
- Accurate in performing equipment and system calculations.

- Creative in developing and designing products.
- Communicate effectively with teams.
- Work closely with staff and other department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Automation System Engineering (Mechanical)
JOB TITLE : Mechanical Engineer
LEVEL : 5

RESPONSIBILITIES

Mechanical Engineer is responsible to design and planning mechanical and electromechanical products and systems by developing and testing specifications and methods.

Knowledge:

- Machining Process
- Overall Equipment Effectiveness (OEE)
- Statistical Process Control (SPC)
- Autonomous Maintenance
- Root cause analysis
- Engineering Design
- Total Quality Management (TQM)
- Machine Load Balancing
- Hydraulic and Pneumatic System
- Numerical Control

Skills:

- Prepare and evaluate product specification including material specification, BOM list and design drawing
- Determine machine operation requirements and machining process
- Carry out resources planning for production requirements including for method, manpower and machinery & equipment
- Carry out machine parameter setting according to product specification
- Carry out machining activities
- Plan CNC machine operation
- Identify process improvement requirement
- Conduct Overall Equipment Effectiveness (OEE) analysis.
- Carry out Factory Acceptance Test (FAT) and Site Acceptance Test (SAT) based on determined requirements.

Attributes (Attitude/Safety/Environmental):

- Analytical skills in solving problems.
- Ensure designs meet legal guidelines and safety requirements.
- Accurate in performing equipment and system calculations.
- Creative in developing and designing products.
- Communicate effectively with teams.
- Work closely with staff and other department.

- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Automation System Engineering (Mechatronic)
JOB TITLE : Mechatronic Technician
LEVEL : 2

RESPONSIBILITIES

Mechatronic Technician is responsible to maintain equipment functionality and minimize downtime. Use advanced knowledge with assembly manufacturing to troubleshoot equipment, make repairs and perform system maintenance and upgrades.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value
- Circuit Theory
- Finite Element Analysis (FEA)
- Machining Process
- Electronic Component Selection
- Ingress Protection rating (IP rating)
- Embedded system programming
- Networking and Communication Protocol
- Instrumentation and Control

Skills:

- Identify trouble areas.
- Determine corrective action
- Suggest and implements equipment improvements to increase operational efficiency
- Maintain appropriate level of technical and professional skills by attending training classes, seminars, exhibits, and trade shows as needed
- Adjust and/or installs special functional parts of machines, devices and control instruments
- Repair or replaces defective automation and machinery parts
- Assembly individual components through to complete systems or special machines in accordance with drawings

Attributes (Attitude/Safety/Environmental):

- Communicate effectively with team work and client.
- Creative in solving problems.
- Relation with another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Automation System Engineering (Mechatronic)
JOB TITLE : Mechatronic Supervisor
LEVEL : 3

RESPONSIBILITIES

Mechatronic Supervisor is responsible to supervise and monitor maintaining of equipment functionality and minimise downtime. Use advanced knowledge with assembly manufacturing to troubleshoot equipment, make repairs and perform system maintenance and upgrades.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value
- Circuit Theory
- Finite Element Analysis (FEA)
- Machining Process
- Electronic Component Selection
- Ingress Protection rating (IP rating)
- Embedded system programming
- Networking and Communication Protocol
- Instrumentation and Control

Skills:

- Inspect mechatronic component repairs and installations.
- Maintain parts inventory.
- Ensure compliance with safety practices.
- Evaluate mechatronic system performance.
- Prepare maintenance operation scheduling.
- Ensures that all data collected regarding work process is accurate and complete.
- Coordinate installation, maintenance and inspection tools and equipment preparation.
- Confirm mechatronic component assembly.
- Prepare and coordinate preventive and corrective for machine and equipment maintenance activities.
- Confirm machine parameter setting.
- Perform supervisory function.

Attributes (Attitude/Safety/Environmental):

- Communicate effectively with team work and client.
- Creative in solving problems.

- Relation with another department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Automation System Engineering (Mechatronic)
JOB TITLE : Mechatronic Assistant Engineer
LEVEL : 4

RESPONSIBILITIES

Mechatronic Assistant Engineer is responsible to assist in researching, designing, developing, or testing automation, intelligent systems, smart devices, or industrial systems control. They also responsible to assist in managing and planning operation works.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value
- Circuit Theory
- Finite Element Analysis (FEA)
- Machining Process
- Electronic Component Selection
- Ingress Protection rating (IP rating)
- Embedded system programming
- Networking and Communication Protocol
- Instrumentation and Control

Skills:

- Assist mechatronic engineer in installation and maintenances of electronic and control systems.
- Provide administrative assistance
- Identify action items and work with the engineering team to close them.
- Work with the engineering team to plan, coordinate and execute mechatronic projects.
- Review project specifications and identify technical constraints and requirements.
- Prepare technical design documents based on project specifications.
- Identify mechatronic system integration and design issues.
- Monitor and report project status to management on regular basis.
- Supervise project activities to ensure timely completion.
- Ensure project deliverables meet quality standards and customer specifications.
- Provide technical guidance to project team when needed.
- Schedule routine maintenance and inspection of mechatronic systems.
- Develop preventive maintenance programs for mechatronic systems.
- Ensure that system breakdowns, failures and repairs are addressed promptly.

Attributes (Attitude/Safety/Environmental):

- Analytical skills in solving problems.
- Ensure designs meet legal guidelines and safety requirements.
- Accurate in performing equipment and system calculations.
- Creative in developing and designing products.
- Communicate effectively with teams.
- Work closely with staff and other department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.

MSIC GROUP : 281 & 282
AREA : Automation System Engineering (Mechatronic)
JOB TITLE : Mechatronic Engineer
LEVEL : 5

RESPONSIBILITIES

Mechatronic Engineer is responsible to research, design, develop, or test automation, intelligent systems, smart devices, or industrial systems control. They also responsible to managing and planning operation works.

Knowledge:

- Geometrical Dimensioning and Tolerance (GD&T)
- Lean Manufacturing
- Mechanical Properties
- Chemical Composition
- Ergonomics and Aesthetic Value
- Circuit Theory
- Finite Element Analysis (FEA)
- Machining Process
- Electronic Component Selection
- Ingress Protection rating (IP rating)
- Embedded system programming
- Networking and Communication Protocol
- Instrumentation and Control

Skills:

- Execute reliable electro-mechanical processes.
- Execute reliable computer control systems for manufacturing equipment.
- Integrate electrical and mechanical systems to enhance manufacturing systems.
- Develop new electro-mechanical concepts for new product lines.
- Draft and document programs for electro-mechanical and test systems.
- Develop programming logic for manufacturing equipment.
- Design and execute new electro-mechanical systems for new product lines.
- Develop and test mechanical devices for high throughput laboratory automation use.
- Manufacture and assemble new equipment with manufacturing group.
- Create software and procedures to control automated lab equipment.

Attributes (Attitude/Safety/Environmental):

- Analytical skills in solving problems.
- Ensure designs meet legal guidelines and safety requirements.
- Accurate in performing equipment and system calculations.
- Creative in developing and designing products.

- Communicate effectively with teams.
- Work closely with staff and other department.
- Adhere to Occupational Safety and Health (OSHA) / Factory and Machinery Act 1967.